THE IRON AGE -- October 13, 1932

J. H. VAN DEVENTER, *Editor*
F. J. WINTERS, E. F. CONE, G. EHRNSTROM, JR.

W. W. MACON, *Consulting Editor*
R. E. MILLER, F. L. PRENTISS, *Cleveland*

A. I. FINDLEY, *Editor Emeritus*
T. H. GERKEN, *Pittsburgh*
R. A. FISKE, *Chicago*

G. L. LACHER, *Managing Editor*
BURNHAM FINNEY, *Detroit*
L. W. MOFFETT, *Washington*

C. E. WRIGHT, *Markets and News Editor*
GERARD FRAZAR, *Boston*
R. G. McINTOSH, *Cincinnati*

CONTENTS

Industrial Russia	567
Size Control in Precision Grinding	570
"Better Times"	572
Heat Treating High-Speed Steel	574
National Metal Congress	577
Meeting of Welding Society	580
September Ingot Production	592
New Equipment	583
News	585
Automotive Industry	587
Personals and Obituaries	588
Letters to the Editor	590
Editorials	591
Markets	593
Construction and Equipment Buying	606
Products Advertised (Advertising Section)	44
Index to Advertisers (Advertising Section)	64

THE IRON AGE PUBLISHING COMPANY, 239 WEST 39th ST., NEW YORK
Division of United Business Publishers, Inc.

F. J. FRANK, *President* G. H. GRIFFITHS, *Secretary* C. S. BAUR, *General Advertising Manager*

Copyright, 1932, by
THE IRON AGE PUBLISHING CO.
Member, Audit Bureau of Circulations
Member, Associated Business Papers

Published every Thursday. Subscription Price: United States and Possessions, Mexico, Cuba, $6.00; Canada, $8.50, including duty; Foreign, $12.00 a year. Single Copy 25 Cents

Cable Address: "Ironage, N.Y."

ADVERTISING STAFF
Emerson Findley, 1362 Hanna Bldg., Cleveland
B. L. Herman, 703 W. Ferry Street, Buffalo, N. Y.
H. K. Hottenstein, 802 Otis Bldg., Chicago
Peirce Lewis, 7338 Woodward Ave., Detroit, and 402 Traction Bldg., Cincinnati
Charles Lundberg, 45 Kent Rd., Upper Darby, Del. Co., Pa.
C. H. Ober, 239 W. 39th St., New York
W. B. Robinson, 1319 Park Bldg., Pittsburgh
W. C. Sweetser, 239 West 39th St., New York
D. C. Warren, P. O. Box 81, Hartford, Conn.

WROUGHT IRON DAYS ARE HERE AGAIN *for*

SMOKE STACK FABRICATION!

• • • •

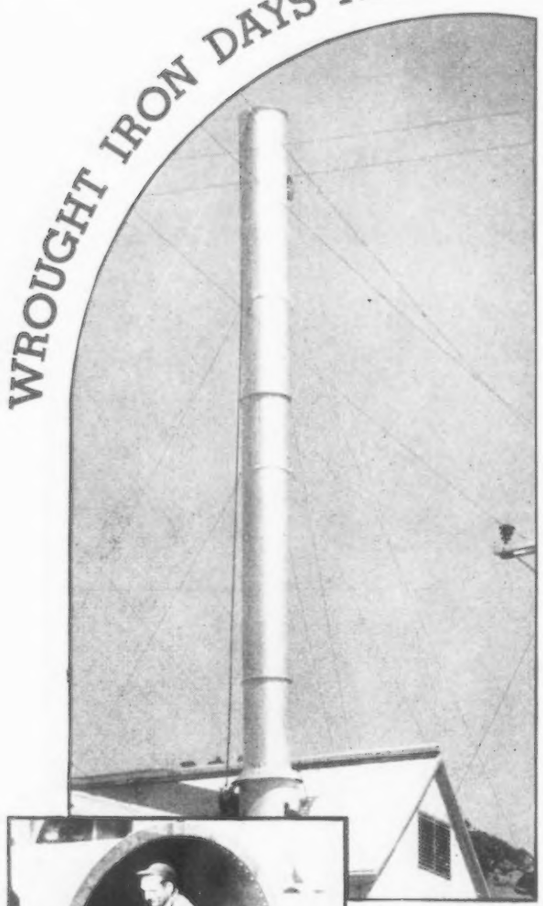
Specify Byers Wrought Iron Plates

FREQUENTLY we receive inquiries from plant engineers regarding the use of wrought iron for stack fabrication. These engineers request information on the additional life wrought iron will bring to smoke stacks for various fuel types of boilers, etc. They also want information on fabrication.

In answering the first of these questions we take pride in pointing to various veteran wrought iron stacks—stacks that have stood both exterior and interior corrosion for a great number of years. (See example on this page.) Our reason in pointing to these service records is based on our conviction that service alone will tell more than we or the manufacturer of any other metal can claim.

In answering questions on stack fabrication we point to the experience of various large fabricators. They find that Byers Wrought Iron Plates present no fabrication problems — that they weld easily, are easily riveted and due to their characteristic surface, take and hold paint longer.

We would like to show you, too, other reasons for the practicability of wrought iron for stack fabrication. A Byers engineer will give complete engineering data on Byers Plates made of the finest genuine wrought iron. He can show you why stacks of Byers Wrought Iron do not embrittle or crack, why they look better, last longer and cut maintenance costs! Send prints of your stack jobs to our Engineering Service Department. We will tell you how Byers Genuine Wrought Iron can be used to best advantage for stack fabrication. A. M. Byers Company, Pittsburgh, Pa. Established 1864.



● New stack of Byers Genuine Wrought Iron Plates for Pacific Gas & Electric Company's San Rafael Plant. Fabricated in California Steel Products Shops. Erected 1932.

● Fabricating the stack

● Wrought iron smoke stack owned by Windisch-Muhlhauser Company, Cincinnati, Ohio. Erected in 1889, the wrought iron parts have delivered 43 years of economical service. Write our Engineering Service Department for the history of this stack.

BYERS GENUINE WROUGHT-IRON PRODUCTS

PIPE · CASING · COUPLINGS · NIPPLES · WELDING FITTINGS · BLOOMS · RIVETS
SPECIAL BENDING PIPE · BAR IRON · TUBING · PLATES · SHEETS · BILLETS · STRUCTURALS

STANDARD of QUALITY for 68 YEARS • • • TODAY BETTER THAN EVER

..THE IRON AGE..

NEW YORK, OCTOBER 13, 1932

ESTABLISHED 1855

Vol. 130, No. 15

Practically all equipment for finer manufacturing must be purchased abroad.

Industrial Russia

Why It Is Far From Self-Sufficiency and Why It Will Remain a Large Market for Quality Products

By HOMER S. TRECARTIN

AMERICAN manufacturers and industrialists are again giving attentive thought to Russia. During the past two years trading conditions with the Soviet Republic have been difficult, and such efforts as were made by our industrial concerns ended up mostly in disappointing results.

Russia is a logical customer for our goods, particularly secondary products such as processed steel, tools and machinery and mechanical devices of all kinds. Trade and commerce in time will find their natural channels and outlets; so now I predict that concerted efforts, about to be renewed here, will bring about a more normal trade with this great new and little understood State.

I say "little understood," because in the few months since my return from Russia so many business men have asked me so many questions as to what the actual conditions are over there. The object, therefore, of this article will be to present a more or less intimate picture of the industrial situation there, to add in some degree to the reader's comprehension of those conditions.

The new Soviet State has achieved remarkable accomplishments. It has also been remarkably successful in letting the world know about its accomplishments. Its great building projects, Stalingrad, Dneiperstroi, Nizhni-Novgorod, the Ural Railroad, are names that come glibly off the tongues of our business men. And knowing of these achievements, one is in danger of making the mistake of assuming that Russia would now be about able to "go it alone."

▲ ▲ ▲

Mr. Trecartin spent over a year in Russia as consulting engineer for the Russian State in its project to establish a great ball and roller bearing factory, "Sharikopodshipnikstroi." This plant was formally opened this spring. It cost over $60,000,000, and is planned to produce 36,000,000 bearings of various types, each year. Mr. Trecartin was general manager of the Roller Bearing Co. of America when Russian representatives approached him to work out the planning and operation of this "giant" undertaking. While in Russia he made surveys for the State of factories in three different industries, and had exceptional opportunities for intimate study.

▼ ▼ ▼

However, to build and construct, with foreign plans and materials, is one thing; and to manage and operate is a different and far more complicated thing. And I am convinced that not in this generation certainly, and probably not in the one to follow, will Russia arrive at any successful degree of management and operation.

I will describe some typical cases there to indicate why I hold this conviction.

The Soviet State in the spring of 1931 had "liquidated" the Swedish concession in Moscow for the manufacture of ball bearings. That is, it had terminated the concession and had bought out the plant and equipment from the Swedish interests, the S. K. F. Co. (I was informed by the Swedish gentlemen that they received fair and satisfactory consideration in this matter.)

This plant had been operating in Moscow for a number of years under Swedish control. The management was Swedish, as were most of the department heads, foremen and machine setters. Nearly all the workers in

The Moscow ball and roller bearing factory has nearly 1,500,000 sq. ft. of floor space.

the plant (about 800) were Russians. Under this management the production, when the concession was liquidated, was 100 per cent of the established "normal," and the average of rejections was under 2 per cent.

Training Was Thorough

For many months prior to the taking over of this operation the Soviet State had its representatives in training in every department, from the manager's office and engineering division, right down through all the production departments. All phases of the plant operation were incorporated in written and graphic form, as were the technological processes and full descriptions of all machine and hand operations.

When the changeover was made some of the best of the Swedish personnel was engaged by the new management to remain for a while. This included a high-grade and thoroughly competent Swedish executive, who was retained as consulting chief engineer, and nine other trained and experienced countrymen of his who were kept as supervisors of the various departments.

Four or five months after the liquidation I was asked to go to this plant and to see what I could do to reorganize it, or to "rationalize" it, as the Russians were so fond of saying. Seemingly it was not doing so well. All the records were made available to me, and I was given carte blanche to the whole factory.

Production Fell Sharply

In those few months the production had fallen from its "norm," which the Swedish management had held near or above 100 per cent, to only slightly above 50 per cent. And the production was steadily dropping. Rejections had gone up to 14 per cent, and were still going up!

This is not a Horatio Alger story. I was able to accomplish but little in rectifying conditions, although I saw what was wrong.

Here was truly an interesting case to observe in an attempt to appraise the ability of this new system to function in modern management problems. This was no new factory erected in some inaccessible spot on the steppes far from sources of labor and raw material and supplies. Here were no new or unknown machines or processes. The raw material was not to blame, as it was the same excellent Swedish steel that had been used right along.

I could not "go" the "cafeteria" in the plant (and neither could you have), so the Swedes hospitably let me eat my luncheons with them. We had to converse together in our not too excellent Russian, as they knew no English; but we managed to understand one another very well. And as I grew to know them, and watched them working, I became convinced that they were not to blame at all for the poor showing of the factory. They were past masters of their trade, and they tried sincerely.

With everything in its favor, the efficiency of the plant under Bolshevist management had dropped to about 25 per cent of what it had been under foreign direction. This 25 per cent is my own rough approximation. In the frenzied attempts to bolster up the production, about double the number of workers was engaged; and with breakage of machines, wasted supplies and spoilage of parts, the actual efficiency was perhaps considerably lower.

Labor Turnover Increases, Living Conditions Get Worse

One of the principal troubles was the turnover of labor and the consequent shortage of trained workers. Strangely, perhaps, the workers had been stable under the management of the capitalistic firm, but had become dissatisfied under the management of their own "workers' state." It sounds like a paradox!

All of the older Russian workers in the plant who dared talk confidentially to me told the same story. Their wages were now being reduced, their food was scarcer and poorer, and their housing was being more and more crowded. In some manner the foreigners had arranged these things better for them.

The engineering and technical forces were about 20 per cent men trained under the old régime from before the revolution. The rest were products of the Soviet schools and universities. These older men were well educated, but they had not been able to keep up with the times in their professions. Their social and economic status under the "dictatorship of the proletariat" was not a fortunate one, and I think their hearts were not in their work. Of the newer technicians, a small percentage trained abroad, in Germany or Switzerland, had good technical education, but little experience in its application. The rest, who were turned out by Soviet institutions, were by far the most assured. They felt competent to decide any questions and to resolve any problems. They were the most useless.

Old Habits of Bureaucracy Persist

It was so hard as to be nearly impossible to get an engineer or executive to do anything. They would invariably agree to do a thing and their doing would consist in instructing someone else to do it. The old habits of bureaucracy are seen in exaggerated form in the functionings of the titled workers in the Soviet organizations. There are exceptions: fine, clear-thinking, forceful men. But the new system, with its theories of non-exploitation of labor, the equality of all, and so on, greatly handicaps even these men. Opportunism is rife in Russia, and there are many ways to call a man to account there. It is dangerous to step far ahead of the multitude even in leadership, for there, of course, one cannot have even the protection of acquiring money.

Inevitable blunders in management are accentuated in Russia by lack of skill and lack of interest among the lesser workers. As an example, I saw 12 large cast iron tumbling barrels which were received in a shipment from Sweden. Of these, 10 had had the frames cracked in unloading. Meetings were called to discuss this, photographs were taken of all the broken frames, but nobody was charged with the blame. It was final-

ly decided to make a claim upon the manufacturer for shipping too weak frames.

Lack of Skill Is Handicap

About the same time I saw three expensive special grinders broken out of a shipment of six just imported. It was hard to see how they could possibly have been broken in the way they were. Sabotage, no doubt; although it may have been ignorance. The OGPU would decide that, with little benefit of doubt.

I watched two Russian workmen repairing an old lathe. They were scraping in new bronze spindle bearings. I admired the way they would mark with blueing, and then take off the high parts with deft sweeps of their curved scrapers. I went by that way the next morning and they were still scraping. Two days later I passed again, and they were still at the work. The journals were only about 4 in. in diameter and maybe twice as long, and I stood and watched, wondering why they were so long about it.

I waited until they marked the shaft and bolted the cap on. Then I saw that instead of merely turning in its bearings, it actually rocked. They had rocked and scraped, and rocked and scraped, and all the time the bearings were elliptical, wider at the sides of the parting than the diameter of the shaft. If they had not been shown their fault they would no doubt be still scraping those bronzes!

A Production Line Built for American Conditions

On another occasion I was asked to survey the proposed layout of the new motor manufacturing "line" in the AMO plant, Moscow's oldest and greatest automobile factory. This line was modeled on the very latest technique from Detroit. The machines specified were the most modern developments of American and German machine tool builders, nearly all being special-purpose devices. It was a beautiful layout, and had been planned in Detroit by a Detroit engineering firm. The principles had mostly been proved in practice in our own great automobile plants.

In my report to the Automobile Trust of the U. S. S. R. I voiced this opinion. But I added that, in my estimation, the layout did not make provision for the entirely different conditions which existed in Russia. I pointed out that in the United States we had many years of background and experience in quantity production; that we had trained superintendents and foremen and skilled machine operators. Also, that the tool manufacturers were nearby to correct faults or to supply spare parts or new machines even on short notice; or that many shops were available if necessary to make parts in an emergency, should an important machine in the line break down.

But it was explained to me that Russia was not merely intending to equal America's "tempo"; she would surpass it. However, I know all the headaches that will occur when that line, like a fine Swiss watch in its exquisite refinement, starts going. Maybe the base of some heavy machine will crack because of the faulty concrete foundation under it; then the centerless grinder spindles will burn out because the wrong oil is used; then a thousand cylinder castings will be spoiled because the multiple miller was set to a wrong gage. We have plenty of troubles in our own manufacturing here, where we have developed it through years to a fine art.

In Stalingrad these things happened, and worse things happened. For a long time they were getting more than 90 per cent rejections on their cylinder head castings. Stalingrad was the show plant of Russia before the whole world, and she had to get it producing. We shall never know at what costs that huge plant was finally brought up to its production. It held to its production for some time; but the latest press reports from the U. S. S. R. show that it has again rapidly slipped backward.

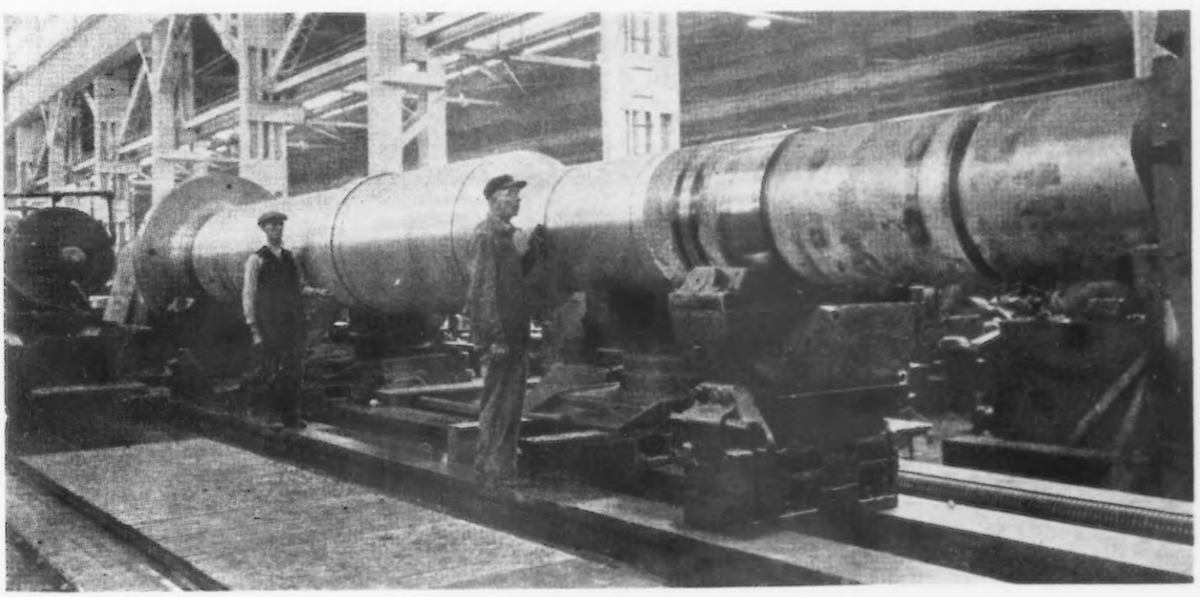
We form our opinions about the Soviet accomplishments largely upon the interpretation of events which the Moscow officials have been able to impose upon us. This has resulted in creating a false impression of Russia's self-sufficiency among many of our industrialists.

Will Be Large Market for Years

The U. S. S. R. is a great and undeveloped country, rich in man power and resources. She will not be able to provide for her own needs for many years, especially in semi-processed materials and in mechanical goods. Her economic, political and social structure is certain to change; more probably I believe by evolutionary processes than by revolution.

My contract with the Russian government took me into England, France, Italy and Germany. I studied and compared the tools and products of these countries, and I know how the Russians feel about them. In general, they prefer our products, especially tools and machinery, to the products of any other country.

In conclusion, I believe that we should formally recognize the U. S. S. R., whether we approve or disapprove of her doctrines, and we should establish diplomatic relations there, as have all the other great powers. Then will our industrialists find a way to obtain our proper share of Russian trade.



Russia cannot produce such products

Technique of Size Control in Precision Grinding Operations

By R. E. W. HARRISON

INTELLIGENT use of the limit system is the key to cheap manufacture.

Even in this enlightened day it sometimes happens that firms will swing into a manufacturing program involving the expenditure of many millions of dollars without first thoroughly investigating the application of a limit system, which would provide the key to cheap and efficient manufacturing. Some of the major industries today are operating without such a system, and therefore without predetermined limits to their dimensional specifications. These loose practices have been gradually disappearing, but the process is a slow and costly one.

When considering manufacturing conditions, it has become customary, when looking for the proof of a statement which in itself is axiomatic, to quote the automotive industry. No excuse is necessary, when pointing to the very successful exploitation of the limit system of manufacture which has been carried out by the larger automobile manufacturing concerns. The extraordinary phenomenon of the placing on the market of a 65 hp. eight-cylinder car at $460 has only been made a commercial possibility by an extremely efficient system of manufacture, whereby all the components are produced within limits of accuracy, which permit the manufacturer to assemble these parts without hand correction.

Widest Consistent Limits Are Necessary

To insure cheap manufacture, tolerances should always be at the maximum permissible, consistent with the correct functioning of the work. Every piece of equipment has a certain projected economic life, and it is a waste of money to design components to endure for a long period of time after the economic life of the equipment has been expended.

As will be gathered from reference to Fig. 1, it is extremely costly to attempt to produce work which approximates perfection. Actually there is no such thing as perfection in this world, so the graph has been arranged to indicate that perfection can only be attained at infinite cost and is, therefore, something which represents an unattainable ideal.

Control over the limits of accuracy must be paid for in a proportionate way, not only in the time of the workmen, but in the capital investment in the machine, the gaging equipment, the type of factory in which the equipment is housed, the engineering, the supervision, and, in fact, every factor which goes to make up the manufacturing cost. Hence, any well balanced manufacturing scheme should be predicated on the idea that in no single instance will a limit of accuracy be prescribed for any particular piece, which is finer than that piece need have to fulfill its functions satisfactorily and to last the anticipated economic life.

Functions of the Precision Grinding Machine

It might be said that the precision grinding machine in conjunction with the automatic lathe has made mass production an economically and commercially attractive means of employing capital. The precision grinding machine in its various forms is the sizing tool of industry, permitting us to manufacture within close limits of accuracy to degrees of finish which impart to the piece an economic life consistent with the capital value involved.

It has been definitely proved that according to the roughness or smoothness of the finish involved, so is the extent of the inevitable initial wear. Reference to Fig. 2 will clearly indicate that there is a quite appreciable margin of wear on even a smoothly ground surface. It is necessary that this initial wear be taken into account when fixing the limits of accuracy.

For instance, referring to a running fit on a shaft which normally would have 0.0035 in. clearance between the maximum diameter of the shaft and the minimum diameter of the hole, would be automatically opened out to say 0.015 in. of maximum clearance after running in, if the shaft or the bore on both be ground roughly. In some classes of

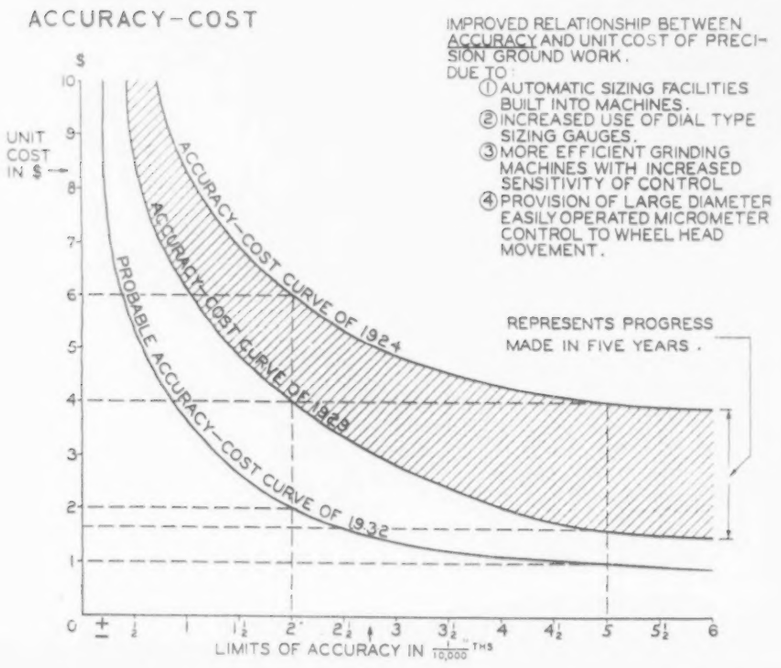

ACCURACY–COST
IMPROVED RELATIONSHIP BETWEEN ACCURACY AND UNIT COST OF PRECISION GROUND WORK.
DUE TO:
① AUTOMATIC SIZING FACILITIES BUILT INTO MACHINES.
② INCREASED USE OF DIAL TYPE SIZING GAUGES.
③ MORE EFFICIENT GRINDING MACHINES WITH INCREASED SENSITIVITY OF CONTROL.
④ PROVISION OF LARGE DIAMETER EASILY OPERATED MICROMETER CONTROL TO WHEEL HEAD MOVEMENT.
$
UNIT COST IN $
ACCURACY–COST CURVE OF 1924
ACCURACY–COST CURVE OF 1929
PROBABLE ACCURACY–COST CURVE OF 1932
REPRESENTS PROGRESS MADE IN FIVE YEARS.
LIMITS OF ACCURACY IN 1/10,000THS

FIG. 1

THE accompanyi… …ls with one of the major phases o… …grinding operations, namely the techni… …control. It is abstracted from a pa… …d by the author at the National Machi… …tice Division meeting of the American … …chanical Engineers at Buffalo. The a… …rman of subcommittee No. … …g committee of the society … …eview of the tentative American … … tolerances and allowances for cylin… …and limit gages, demonstrates in the … …g paper that the intelligent use of the … … is a major key to cheap … …e.

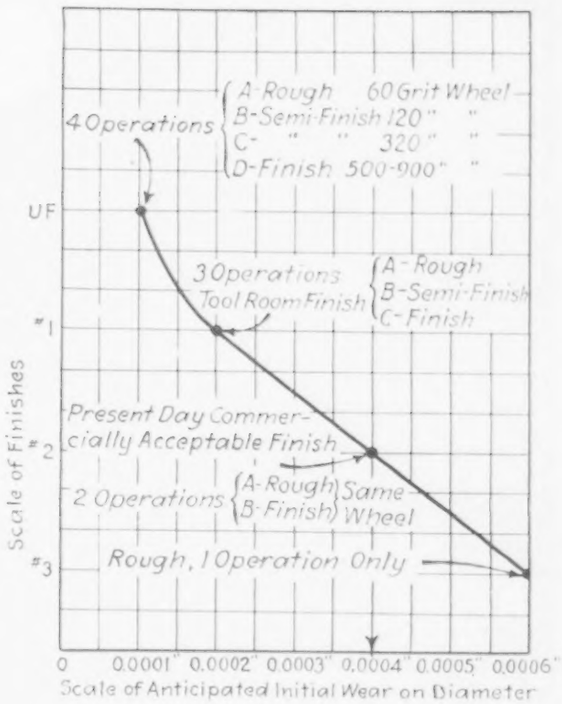


FIG. 2

mechanism such clearance … fatal to correct functioning.

It is futile to specify cl… of accuracy on parts which … ished with a rough surface, … as the initial wear will tak… mensions of the piece out of … scribed tolerance area. To … example, it would be extreme… tional to make a 1 in. plug ga… say a No. 3 finish, as it is … this plug gage could … size and, therefore, its … correctly beyond, say … hours' usage.

Those who have h… of dismantling an… received plenty … ful usage, wil… finish on the … is smooth an… the initial v… out disrupt… Once the i… care of p… is alm…

The G…

The grin… removal too… metal at a c… specified rate. … lationship betwe… the machine and t… moval, and there is … between the speed at … sizing can be accomplishe… accuracy of the work after the si… operation.

In both internal and external operations, eccentricity must first be removed before sizing accuracy can be imparted. Also lack of parallelism, chatter marks and other imperfections must first be removed before an attempt is made to secure an accurate dimension on a given diameter.

In the case of the internal grinding machine with the grinding wheel carried on the end of a relatively small diameter spindle often greatly overhung, and necessarily operated in a condition and a place where the maximum rigidity is difficult to attain, the previous inaccuracies of the work prior to grinding exercise a tre… influence over the amount of … secure accuracy in size, … nish, parallelism and … iodic errors.

…st be maintained … demanded from … grinding and … The work … uld invaria… …ccuracy … or the …, the … for the … the piece … mmediately … any cases it … economically … ts of distor… … is permitted … ment.

…rnal grinding, as … grinding, the in… …tomatic grinding ma… …ought to light many fac… …ing production hitherto not given due consideration.

Automatic grinding machine operations entail a consistency in preceding conditions far in excess of that required for individual or manual production, and this condition has thrown a searchlight on to such factors as excessive stock, variation in stock, lack of parallelism, eccentricity, faulty centering, excessive burrs, lack of consistency in the metallurgical makeup of the material, and a host of other minor things, all of which exact their toll from the possible profit in the grinding operation. In the case of external grinding, as in internal grinding, there is a definite responsibility on the processing department to specify the limits of accuracy to which the work should be turned, bored and centered prior to the grinding operation. The practice of making inspections between operations is as good today as when it was first inaugurated.

Variation in Amount of Stock on Surface Grinding

The one factor which most adversely affects the economics of cheap surface grinding is the wide variation in the thickness of the pieces presented to the grinding wheel. It is as true of the grinding machine as any other machine tool that it is only a productive unit when the cutting element is buried in the work. Variation in the amount of stock involves free traversing or cutting air rather than metal, and this is costly and wasteful. In this case also the matter must be taken care of by the work processing department, and definite limits set which will insure that, while not imposing too heavy a burden on the foundry or machine shop, the stock for removal by the surface grinding machine is not excessive in regard to amount or variety.

Just as in the case of operations previously cited, it is as economically unsound to underburden the grinding machine with responsibility for correct sizing, thereby throwing the production scheme out of balance by demanding an accuracy from the previous operations in excess of that which the particular machine tool involved will normally produce when fully loaded. Excessive accuracy demands on drilling machines, boring machines,

(*Continued on Advertising Page* 16)

Technique of Size Control in Precision Grinding Operations

By R. E. W. HARRISON

INTELLIGENT use of the limit system is the key to cheap manufacture.

Even in this enlightened day it sometimes happens that firms will swing into a manufacturing program involving the expenditure of many millions of dollars without first thoroughly investigating the application of a limit system, which would provide the key to cheap and efficient manufacturing. Some of the major industries today are operating without such a system, and therefore without predetermined limits to their dimensional specifications. These loose practices have been gradually disappearing, but the process is a slow and costly one.

When considering manufacturing conditions, it has become customary, when looking for the proof of a statement which in itself is axiomatic, to quote the automotive industry. No excuse is necessary, when pointing to the very successful exploitation of the limit system of manufacture which has been carried out by the larger automobile manufacturing concerns. The extraordinary phenomenon of the placing on the market of a 65 hp. eight-cylinder car at $460 has only been made a commercial possibility by an extremely efficient system of manufacture, whereby all the components are produced within limits of accuracy, which permit the manufacturer to assemble these parts without hand correction.

Widest Consistent Limits Are Necessary

To insure cheap manufacture, tolerances should always be at the maximum permissible, consistent with the correct functioning of the work. Every piece of equipment has a certain projected economic life, and it is a waste of money to design components to endure for a long period of time after the economic life of the equipment has been expended.

As will be gathered from reference to Fig. 1, it is extremely costly to attempt to produce work which approximates perfection. Actually there is no such thing as perfection in this world, so the graph has been arranged to indicate that perfection can only be attained at infinite cost and is, therefore, something which represents an unattainable ideal.

Control over the limits of accuracy must be paid for in a proportionate way, not only in the time of the workmen, but in the capital investment in the machine, the gaging equipment, the type of factory in which the equipment is housed, the engineering, the supervision, and, in fact, every factor which goes to make up the manufacturing cost. Hence, any well balanced manufacturing scheme should be predicated on the idea that in no single instance will a limit of accuracy be prescribed for any particular piece, which is finer than that piece need have to fulfill its functions satisfactorily and to last the anticipated economic life.

Functions of the Precision Grinding Machine

It might be said that the precision grinding machine in conjunction with the automatic lathe has made mass production an economically and commercially attractive means of employing capital. The precision grinding machine in its various forms is the sizing tool of industry, permitting us to manufacture within close limits of accuracy to degrees of finish which impart to the piece an economic life consistent with the capital value involved.

It has been definitely proved that according to the roughness or smoothness of the finish involved, so is the extent of the inevitable initial wear. Reference to Fig. 2 will clearly indicate that there is a quite appreciable margin of wear on even a smoothly ground surface. It is necessary that this initial wear be taken into account when fixing the limits of accuracy.

For instance, referring to a running fit on a shaft which normally would have 0.0035 in. clearance between the maximum diameter of the shaft and the minimum diameter of the hole, would be automatically opened out to say 0.015 in. of maximum clearance after running in, if the shaft or the bore on both be ground roughly. In some classes of

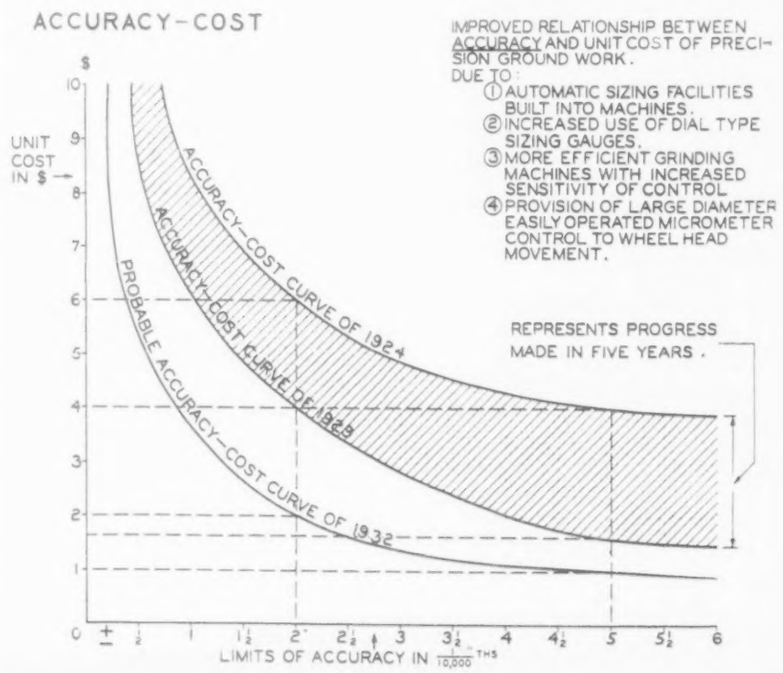

ACCURACY–COST
IMPROVED RELATIONSHIP BETWEEN ACCURACY AND UNIT COST OF PRECISION GROUND WORK.
DUE TO:
① AUTOMATIC SIZING FACILITIES BUILT INTO MACHINES.
② INCREASED USE OF DIAL TYPE SIZING GAUGES.
③ MORE EFFICIENT GRINDING MACHINES WITH INCREASED SENSITIVITY OF CONTROL
④ PROVISION OF LARGE DIAMETER EASILY OPERATED MICROMETER CONTROL TO WHEEL HEAD MOVEMENT.
$
UNIT COST IN $
ACCURACY–COST CURVE OF 1924
ACCURACY–COST CURVE OF 1928
PROBABLE ACCURACY–COST CURVE OF 1932
REPRESENTS PROGRESS MADE IN FIVE YEARS.
LIMITS OF ACCURACY IN TENTHS

FIG 1

THE accompanying article deals with one of the major phases of precision grinding operations, namely the technique of size control. It is abstracted from a paper presented by the author at the National Machine Shop Practice Division meeting of the American Society of Mechanical Engineers at Buffalo. The author, who is chairman of subcommittee No. 1, which is the working committee of the society charged with the review of the tentative American standards for tolerances and allowances for cylindrical parts and limit gages, demonstrates in the accompanying paper that the intelligent use of the limit system is a major key to cheap manufacture.

mechanism such clearance would be fatal to correct functioning.

It is futile to specify close limits of accuracy on parts which are finished with a rough surface, inasmuch as the initial wear will take the dimensions of the piece out of the prescribed tolerance area. To quote an example, it would be extremely irrational to make a 1 in. plug gage with say a No. 3 finish, as it is obvious that this plug gage could not retain its size and, therefore, its ability to gage correctly beyond, say, the first few hours' usage.

Those who have had the experience of dismantling an old car which has received plenty of clean oil and careful usage, will have noted that the finish on the crank pins and journals is smooth and silvery; in other words, the initial wear has taken place without disruption to the basic surface. Once the initial wear has been taken care of properly, the subsequent wear is almost negligible.

The Grinding Machine Should Not Be Overburdened

The grinding machine is a metal removal tool, capable of removing metal at a certain maximum definite specified rate. There is a definite relationship between the horsepower of the machine and the rate of metal removal, and there is a definite relation between the speed at which accurate sizing can be accomplished and the accuracy of the work after the sizing operation.

In both internal and external operations, eccentricity must first be removed before sizing accuracy can be imparted. Also lack of parallelism, chatter marks and other imperfections must first be removed before an attempt is made to secure an accurate dimension on a given diameter.

In the case of the internal grinding machine with the grinding wheel carried on the end of a relatively small diameter spindle often greatly overhung, and necessarily operated in a condition and a place where the maximum rigidity is difficult to attain, the previous inaccuracies of the work prior to grinding exercise a tremendous influence over the amount of time taken to secure accuracy in size, concentricity, finish, parallelism and freedom from periodic errors.

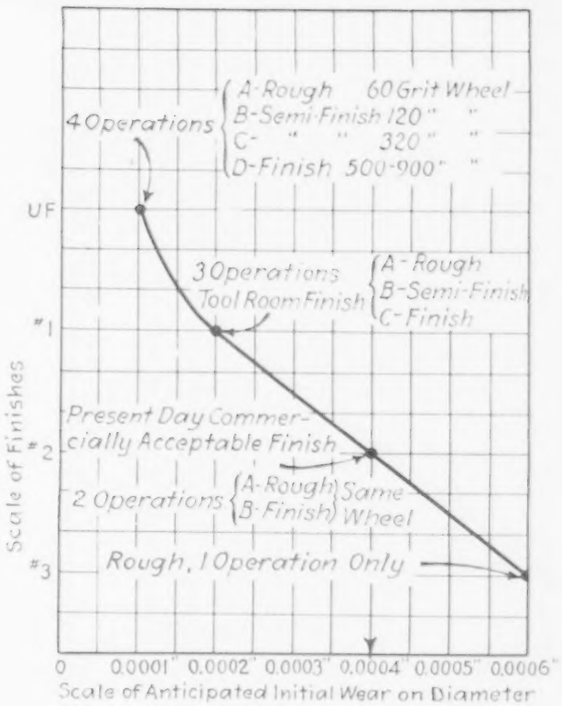


FIG. 2

A nice balance must be maintained between the accuracies demanded from the operations preceding grinding and the grinding operation. The work processing department should invariably set down the limits of accuracy for each operation, not only for the grinding, but for the turning, the boring, the milling and in fact for the surfacing of any portion of the piece during the operations immediately preceding grinding. In many cases it is desirable and in fact economically necessary to specify limits of distortion to which the piece is permitted to go during heat treatment.

In the case of external grinding, as in that of internal grinding, the increased use of automatic grinding machines has brought to light many factors affecting production hitherto not given due consideration.

Automatic grinding machine operations entail a consistency in preceding conditions far in excess of that required for individual or manual production, and this condition has thrown a searchlight on to such factors as excessive stock, variation in stock, lack of parallelism, eccentricity, faulty centering, excessive burrs, lack of consistency in the metallurgical makeup of the material, and a host of other minor things, all of which exact their toll from the possible profit in the grinding operation. In the case of external grinding, as in internal grinding, there is a definite responsibility on the processing department to specify the limits of accuracy to which the work should be turned, bored and centered prior to the grinding operation. The practice of making inspections between operations is as good today as when it was first inaugurated.

Variation in Amount of Stock on Surface Grinding

The one factor which most adversely affects the economics of cheap surface grinding is the wide variation in the thickness of the pieces presented to the grinding wheel. It is as true of the grinding machine as any other machine tool that it is only a productive unit when the cutting element is buried in the work. Variation in the amount of stock involves free traversing or cutting air rather than metal, and this is costly and wasteful. In this case also the matter must be taken care of by the work processing department, and definite limits set which will insure that, while not imposing too heavy a burden on the foundry or machine shop, the stock for removal by the surface grinding machine is not excessive in regard to amount or variety.

Just as in the case of operations previously cited, it is as economically unsound to underburden the grinding machine with responsibility for correct sizing, thereby throwing the production scheme out of balance by demanding an accuracy from the previous operations in excess of that which the particular machine tool involved will normally produce when fully loaded. Excessive accuracy demands on drilling machines, boring machines,

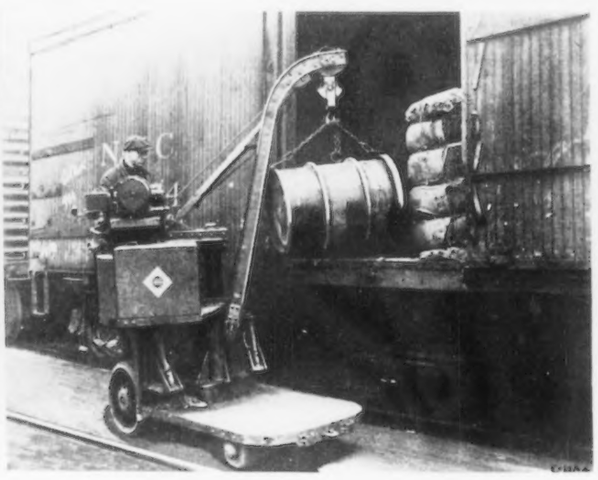
(*Continued on Advertising Page* 16)

"Better Times"—

Fifth in a series of "Performance Pages" as selected from actual practice by The Iron Age Editors

Doing the Work in One-Sixteenth of the Time

One man handles these brake beams from car to storehouse in 6 minutes for 20 beams. Two men previously required 100 minutes for the same work.



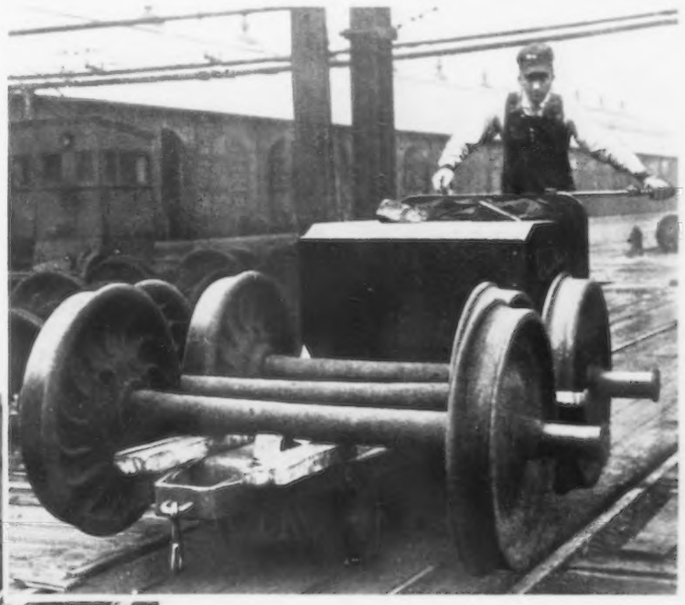
Cutting the Loading Time in Half and Using One Instead of Three Men

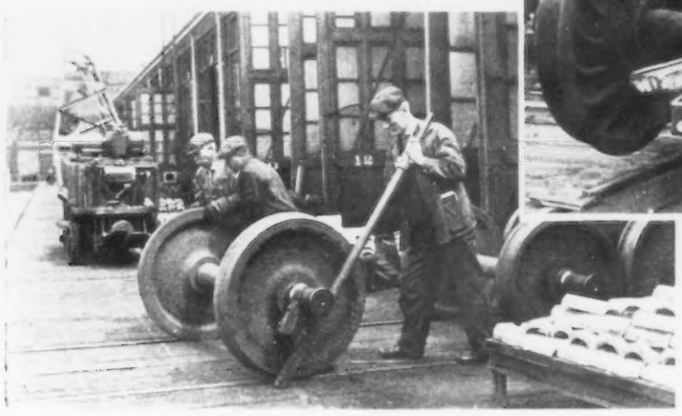
One man now loads a barrel of paint from warehouse into car in one-half the time formerly taken by three men.

OPERATIONS: Mechanical handling of products and product parts

EQUIPMENT: Elwell-Parker Electric Trucks

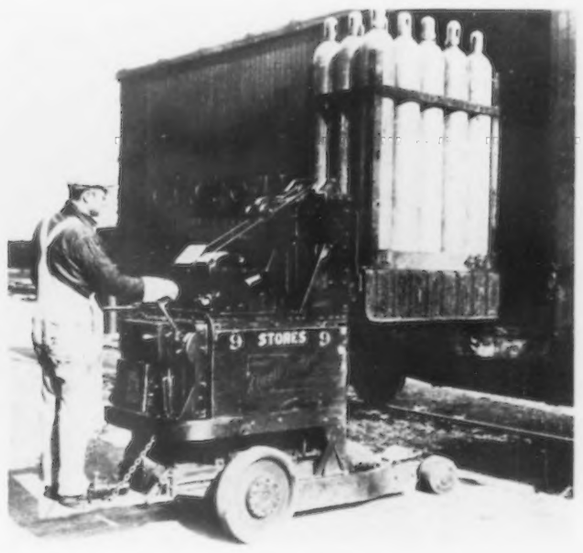
FROM the standpoint of the plant management, a dollar saved is a dollar earned, no matter whether the saving is made in direct productive operations or in the items composing overhead. Interplant transportation and material or product handling are as susceptible to "modernization" through the use of improved equipment as are such direct operations as machining, stamping, forging, etc. Obsolescence of handling methods is frequently overlooked but its existence provides a fertile field for savings and earnings.





A Large Saving in Handling Wheels

One man handles 3 pairs of 2500 lb. car wheels 150 ft. in a total time of three minutes. Three men formerly took 18 minutes to roll them by hand.



The Same Job in One-Twentieth of the Time

One man handles the transfer of these bottles from filling house to car in one-twentieth the time he previously required by hand.

▲ ▲ ▲ The Temperature-Atmosphere

By SAM TOUR,
Vice-president
Lucius Pitkin, Inc.
New York

THE literature in connection with the heat treatment of high-speed steel is considerable and no attempt will, therefore, be made to review it. In a paper published in *Fuels and Furnaces*, September, 1930, on "The Heat Treatment of Delicate Tools of High-Speed Steel" by the author, it was pointed out that furnace atmospheres have something to do with grain growth in high-speed steel during heat treatment and that, with proper control of these atmospheres, not only can the surface condition of the steel be protected, but undue grain growth can be eliminated without the sacrifice of satisfactory red hardness in the finished tool.

Pseudo-Binary Diagram of High-Speed Steel

The pseudo-binary diagram for high speed steel as developed by Grossmann and Bain in their book, "High Speed Steel," is shown in Fig. 1. This is a valuable diagram for consideration. Standard high-speed steels of the 18-4-1 type can be considered as falling in the neighborhood of 30 to 35 per cent of complex carbides as indicated on this chart. The important item to consider is the location with regard to temperature of the line A-B and the significance of this line. Grossmann and Bain show it at a temperature of 1300 deg. C. or 2372 deg. F.

If high-speed steel containing the equivalent of 28 or more per cent of the complex carbide is heated above this line A-B, liquid eutectic will be formed. In other words, if in actual practice high-speed steel tools were actually heated to 2400 deg., incipient melting should result. If the maximum heat-treating temperatures are kept below the line A-B, then no liquefaction is to be expected and the structure should be austenite and carbide with the austenite carrying the maximum amount of carbide in solution that is possible. In other words, high-speed steel heated to temperatures just below the line A-B will have maximum carbides in a solution of austenite saturated with carbide for that temperature.

In the work reported in this paper, no attempt has been made to check the exact location of the line A-B, but an effort has been made to determine whether or not the line A-B is shifted with respect to temperature by a change in the furnace atmosphere. If at one furnace atmosphere, we find liquefaction for a given temperature, and in another furnace atmosphere but at the same temperature for the same period of time, no liquefaction, then it seems that the line A-B has indeed been shifted by the change in furnace atmosphere.

Heat-Treating Practice Used

All of the pieces used in this work were taken from one bar of annealed standard 18-4-1 tungsten high-speed steel. A 1-in. bar of hot-rolled and annealed steel was turned down to approximately ¾-in. diameter in order to remove all surface skin. Pieces approximately 1 in. long were cut off and a V-shaped notch approximately 1/16 in. thick was turned in at the center of each of these 1-in. pieces. Serial numbers were stamped on each end of each piece together with the letter A at one end and the letter B at the other end so as to be able to identify the pieces throughout the work.

All preheating was done in a metallic resistor electric furnace of the certain curtain type built by C. I. Hayes, Inc., and equipped with manometer tubes to indicate and control the proportion of gas and air used to maintain the furnace atmosphere.

All of the high-heat treatments were carried out in a Globar heated electric furnace of the same type and equipped also with manometer tubes for indication and control of the gas-air ratios used for maintaining the furnace atmosphere. A diagram

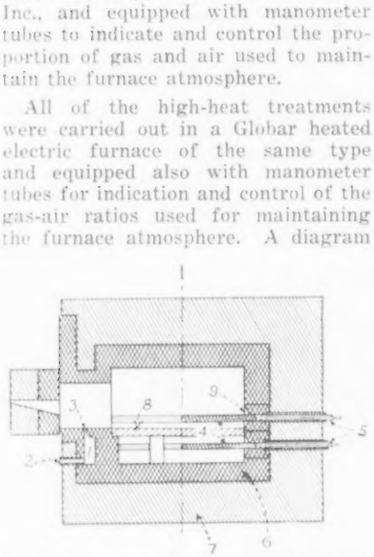
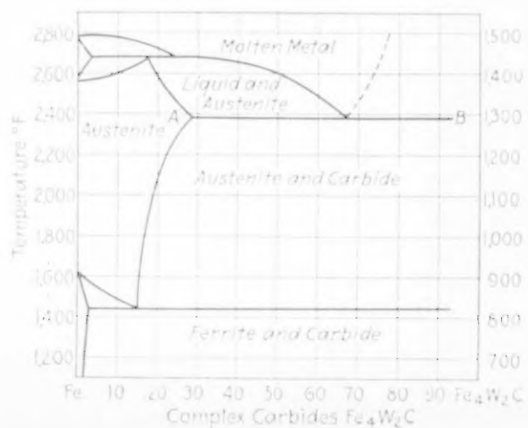


Fig. 2—Diagram of the Hayes furnace used in this research. (1) Atmosphere combustion chamber. (2) Inlet for manometer. (3) Slat emitting curtain of combusted gases. (4) Globar heating elements. (5) Water-cooled terminals. (6) Refractory lining. (7) Heat insulation. (8) Hearth plate. (9) Terminal bricks.

of this furnace and the method of atmosphere control are shown in Fig. 2. Fig. 3 is a diagram of the carbon monoxide-carbon dioxide-oxygen relationship in this furnace when operating at a temperature of 2400 deg. F. with various proportions of air being admitted for a given proportion of gas. The chart of furnace atmospheres for given settings, as indicated in Fig. 3, was not accepted in whole for the work reported upon in this paper, but actual orsat analyses were made for each individual heat treatment.

All samples were preheated for 30 min. at 1600 deg. F. in an atmosphere which showed on analyses to contain 3 per cent of oxygen and 11.8 per cent of carbon dioxide and no carbon monoxide. Pieces for the hardening treatment were treated for periods of



▲ ▲ ▲

FIG. 1—Pseudo-binary diagram for high-speed steel as developed by Grossmann and Bain.

▼ ▼ ▼

Problem in High-Speed Steel ▲ ▲ ▲

FROM a study which the author has made of the effect of variations in the atmospheric composition of a high heat furnace upon the structure of high-speed steel, treated at 2400 deg. F., the indications are that the structure resulting is materially affected by the oxygen and carbon monoxide content of the furnace atmosphere during the heat treatment, and that this atmosphere shifts the equilibrium diagram for standard 18-4-1 high-speed steel. There are also indications that unless very careful atmospheric control is obtainable, 2400 deg. F. is probably too high for the treatment of such steel and that possibly 2360 deg. F. is better for general practice. The author's conclusions are abstracted from a paper delivered before the steel treaters at the National Metal Congress in Buffalo, Oct. 6.

time as indicated, at temperatures as indicated, and in atmospheres as indicated. For each condition of atmosphere at the higher temperature, the valves were adjusted and the furnace allowed to operate for several minutes and then orsat analyses made of the atmosphere; then after this was found satisfactory, the piece to be hardened, or pieces, were inserted and the hardening accomplished after which orsat readings again were taken to make sure that the atmospheric conditions had not changed during the period that the specimens under test were in the high heat.

Samples for gas analyses were withdrawn through a nickel tube, a considerable quantity being flushed through the apparatus each time to make sure that a true sample from the heating chamber itself was being analyzed. The inlet end of the nickel tube in each case was at the center of the furnace where the samples being heat treated were to be placed. Previous work had indicated that practically no variation in furnace atmosphere exists in the region where work is being heated in these furnaces.

After heating for the indicated time, the specimens were withdrawn from the furnace with a pair of tongs and quenched in quenching oil till cold, then washed and dried. After noting the surface appearance of the samples, they were fractured along the V notch which had been cut in previously and the A portions set aside.

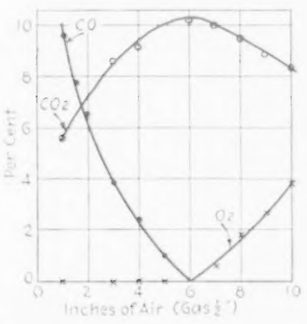


Fig. 3—Diagram of the carbon monoxide-carbon dioxide-oxygen relationship in the Hayes furnace when operating at 2400 deg. F.

The B portions were all drawn at 1050 deg. F. for one hour in a Leeds & Northrup Homo electric furnace. All A and B portions were then examined metallographically after etching with 5 per cent nital solution to develop the grain boundaries. A uniform etching time was not practiced, but in each case etching was continued to develop properly the grain boundary structure.

Results and Discussion

No attempt is made in this paper to tabulate all of the samples which were run, nor to show micrographs of all the structures obtained. The significant ones are tabulated in the table, together with remarks as to the appearance of the fracture of the specimens as hardened, the surface appearance of the specimens as hardened and a brief note regarding the amount of eutectic found on metallographic examination. Micrographs at 500 magnification are shown of each of the specimens indicated in the table. [Only part of these are reproduced in this abstract.] Some of the results follow:

Specimen No. 6, as heated to 2300 deg. F. for 10 min. in an atmosphere containing approximately 5 per cent carbon monoxide, came out with fine clean surface, a fine grain fracture and a structure as indicated in Fig. 4.

Specimen No. 4 treated to the same temperature and for the same time as specimen No. 6 but in an atmosphere containing no carbon monoxide and 0.8 per cent of oxygen showed a similar fine grain fracture but some surface scale from the heat treatment and a structure showing a somewhat, although not decidedly, larger grain size than resulted from the treatment given to specimen No. 6.

Specimen No. 1 treated for the same time and at the same temperature as specimens Nos. 4 and 6, but in an atmosphere of air containing 18 per cent oxygen showed decided grain growth as indicated by a coarse fracture and decided scaling of the surface.

Specimen No. 15 was heat treated to 2360 deg. F. for 3 min. only in an atmosphere containing 6.5 per cent of carbon monoxide resulting in a fine grain structure and a satisfactory surface. Practically no grain growth is indicated for this treatment in this atmosphere.

Specimen No. 15 was heated for only 3 min. to 2400 deg. F. in an atmosphere containing 10.3 per cent of carbon monoxide and showed on fracture only very slight coarsening of the grain, a satisfactory surface after heat treatment, and a grain growth and a certain amount of coalescence of carbides.

Specimen No. 14 was heated for 10 min. at 2400 deg. F. in an atmosphere containing 10.3 per cent of carbon monoxide, the fracture showing some coarsening of the grain, and the surface a very slight amount of scale. The structure showed a considerable grain growth but no apparent intercrystalline liquefaction.

Specimen No. 13 was heated for 10 min. at 2400 deg. F. in an atmosphere containing 4.6 per cent of carbon monoxide instead of the 10.3 per cent used on specimen No. 14. The surface of the specimen showed considerable scale, the structure as indicated in Fig. 5 showing very great grain growth and the formation of some eutectic indicating the starting of intercrystalline liquefaction.

Specimen No. 12 was also heated for 10 min. at 2400 deg. F. but in an atmosphere containing 2.8 per cent of carbon monoxide instead of the higher percentages used in the previous two specimens described. Enormous grain growth resulted and numerous eutectic areas of larger proportions than found when an atmosphere containing roughly 5 per cent of carbon monoxide was used. The eutectic areas are larger and more numerous.

Specimen No. 11 was also treated for 10 min. at 2400 deg. F. but in an atmosphere containing no carbon monoxide and no oxygen and 11.4 per cent of carbon dioxide. This specimen was badly scaled and a very considerable amount of eutectic structure was formed.

Specimen No. 10 was also treated for 10 min. at 2400 deg. F. but in an atmosphere containing 4.2 per cent of oxygen and 8 per cent of carbon dioxide. This specimen was very badly scaled indeed and the structure showed fully 50 per cent of the

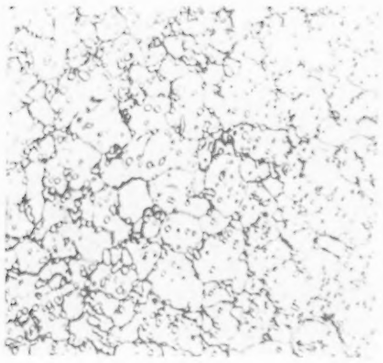


Fig. 4—Fine grain structure of specimen No. 6, heated to 2300 deg. F. for 10 min. in special atmosphere. 500 diameters.

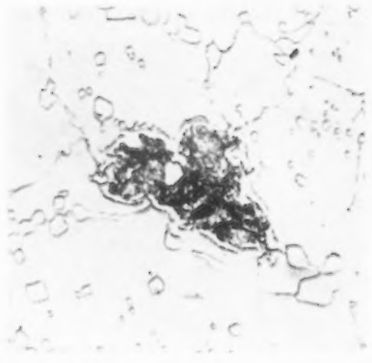


Fig. 5—Large grain growth and formation of eutectic structure in specimen No. 13. 500 diameters.

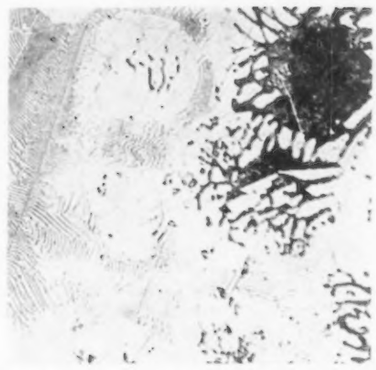


Fig. 6—The quenched structure of specimen No. 8 showing practically 100 per cent eutectic. 500 diameters.

material had been changed over to the eutectic formation.

Specimen No. 8 was similarly treated for 10 min. at 2400 deg. F. but in air containing 18.4 per cent of oxygen and no carbon monoxide. The specimen almost scaled away in this treatment and the resulting structure revealed practically 100 per cent formation of the eutectic. The as quenched structure is shown in Fig. 6.

The more active formation of the eutectic, as indicated by specimens Nos. 8 and 10 treated in atmospheres containing considerable oxygen or even in specimen No. 11 treated in an atmosphere containing considerable carbon dioxide and no carbon monoxide, might be attributed to self-heating as the result of the burning of iron to iron oxide on the surface of the specimens. Sufficient self-heating, however, to result in any appreciable increase in the actual temperature of a specimen of this size could hardly be expected, however, in an atmosphere containing 2.8 per cent of carbon monoxide as in specimen No. 12 or 4.6 per cent as in specimen No. 13.

Conclusion

It would seem as though the above work indicates that the line A-B referred to previously in connection with Fig. 1 is actually shifted by the change in the furnace atmospheres and that for low-carbon monoxide content this line is below 2400 deg. F. and, for a carbon monoxide content of around 10 per cent, this line is slightly above 2400 deg. F. If we assume that the line is normally at about 1300 deg. C. or 2372 deg. F., as indicated by Grossmann and Bain, then we should make sure that all high-speed steel is treated either below this temperature or else in an atmosphere containing sufficient carbon monoxide to raise this critical temperature sufficiently so that, for the temperature actually used, no eutectic formation results.

That the approach to this line A-B is also affected by furnace atmospheres is indicated in the amount of grain growth resulting at temperatures of 2300 deg. F. The rate of grain growth might be considered as a function of how near the specimen is heated to the line A-B. If the line A-B is shifted upward by an atmosphere containing considerable carbon monoxide, then we can safely heat steel to a higher temperature for heat treatment without serious grain growth.

Samples of 18-4-1 High-Speed Steel. Preheated 30 Min., 1600 Deg. F., 3 per cent Oxygen
A—As quenched specimen
B—As quenched and drawn 1 hour at 1050 Deg. F.

Specimen No.	Hardening Temperature, Deg. F.	Time in Furnace, Min.	CO_2	O	CO	Remarks
6-A	2300	10	8.2	0	5.1	Fine grain; surface O. K.
4-A	2300	10	10.8	0.8	0	Fine grain but some surface scale.
1-A	2300	10	0	18.0	0	Grain growth; scaled.
19-A	2360	3	6.2	0	6.5	Fine grain; surface O. K.
15-A 15-B	2400	3	8.1	0	10.3	Very slight grain growth; surface O. K.
14-A 14-B	2400	10	8.1	0	10.2	Some grain growth; surface slight scale.
13-A 13-B	2400	10	9.6	0	4.6	Great grain growth; eutectic forming in spots; surface scaled.
12-A 12-B	2400	10	8.8	0	2.8	Great grain growth; numerous eutectic areas and larger; scaly.
11-A 11-B	2400	10	11.4	0	0	Considerable eutectic formation; badly scaled.
10-A 10-B	2400	10	8.0	4.2	0	50 per cent transformed; very badly scaled.
8-A 8-B	2400	10	0	18.4	0	100 per cent transformed; almost scaled away.

New Synthetic Liquid Insulator

A new synthetic liquid insulator has been announced by the General Electric Co. To it are ascribed not only the advantages of mineral oil as an insulating and cooling medium for electric equipment, but, in addition, non-inflammable and non-explosive properties. Designated by the trade name Pyranol, the material is produced in different forms for different purposes, all being synthetic organic dielectrics of varying physical and electrical properties and all having a high dielectric constant.

For economic reasons, mineral oil will probably remain in general use for years, according to General Electric engineers at Pittsfield, Mass., but commercial installations of Pyranol indicate numerous applications where the new material is especially valuable. Capacitors can be made physically smaller per microfarad, with increased reliability; and the higher cost of transformers with Pyranol is justified when the equipment must be completely proof against fire and explosion hazards. Since the liquid is a solvent for some materials ordinarily used in electric equipment, particularly transformers, the apparatus must be designed specially for its use.

Technical and Other Features of National Metal Week

IN the face of conditions decidedly unfavorable to even partial success, the attendance and interest in the National Metal Congress at Buffalo, Oct. 3 to 7, exceeded expectations. Sponsored by the American Society for Steel Treating, six other technical organizations joined in impressive technical programs at which over 90 papers were scheduled, and in an exposition which made a very favorable impression (THE IRON AGE, Sept. 22). Technical sessions of all the societies were well attended, particularly those of the steel treaters and the welders. There was a noticeable spirit of optimism among the delegates, with many reports of a better month in September than in a long time.

Technical sessions of all the organizations were held in the morning of each day at the headquarters, Hotel Statler, with afternoon meetings in the 174th Regiment Armory, where the exposition was housed. At all sessions there was distinctly noticeable a liberal representation of prominent leaders and workers in each organization.

This report is concerned chiefly with the activities of the A.S.S.T. On other pages is an account of the convention of the American Welding Society, with the high spots of some of the other meetings reserved for later publication.

Steel Treaters' New Officers

Keen interest centered in the selection of new officers for the A.S.S.T. Nominations were not made until shortly before the annual meeting on Wednesday morning, Oct. 5. The selections are found in another column. Mr. Eisenman was unanimously nominated for secretary for two years. The present treasurer, A. T. Clarage, of Chicago, holds office for one year more.

The customary reports of the officers were made at this meeting. A. H. D'Arcambal, Pratt & Whitney, Hartford, Conn., the president, opened the meeting with an appropriate and brief address in which he emphasized the fact that the society had lost only about 10 per cent of its membership. The treasurer, Mr. Clarage, read a detailed report of the condition of the treasury, which shows a surplus of about $114,000 as of Sept. 30. He stated that the income for the first nine months of this year had been approximately $79,600, with expenses about $85,000, the net loss being around $5,300, which would probably be increased to about $10,000 by the end of the year, due to losses in this year's exposition and in advertising revenue from the society's publications.

Secretary Eisenman read a detailed report of his own work and that of the board of directors. Some of the points of interest include statements that the society was not "in the red" during the first two years of the depression, that the combined assets of the chapters and groups are about $39,000, and that salary and other reductions during this year had effected a saving of about $32,500. The organization of a new group of about 80 men at Muncie, Ind., was announced.

The president's bell, awarded annually, was presented by President D'Arcambal to the Montreal Chapter. It was accepted by C. F. Pascoe of that chapter, one of the national directors.

Howe Medal Awarded

At the annual banquet on Thursday evening, Oct. 6, the Henry M. Howe medal, awarded each year for the best technical paper at the previous year's convention, was bestowed on F. M. Walters, metallurgist, Carnegie Institute of Technology, Pittsburgh, for his paper on "Alloys of Iron, Manganese and Carbon," delivered before the Boston convention in September, 1931.

Total registration for the week was 3119, which contrasts with 4000 at the Boston meeting last year. The average attendance at the sessions was 250 to 300.

▲ ▲ ▲

OFFICERS FOR 1933

President: W. B. Coleman, vice-president, W. B. Coleman Co., Philadelphia.

Vice-president: W. H. Phillips, vice-president, Molybdenum Corpn. of America, Pittsburgh.

Secretary (2 years): W. H. Eisenman, Cleveland.

Directors (2 years): R. S. Archer, director of research, A. O. Smith Corpn., Milwaukee, and H. G. Keshian, metallurgist, Chase Companies, Inc., Waterbury, Conn.

▼ ▼ ▼

Bain Delivers Campbell Lecture

The seventh Campbell memorial lecture was delivered on Oct. 5 by Edgar C. Bain, research metallurgist, United States Steel Corpn. Research Laboratories, Kearny, N. J. His subject was "Factors Affecting the Inherent Hardenability of Steel." A brief abstract is found on another page. Dr. Zay Jeffries, the chairman, a past-president and treasurer of the society, and also one of the former lecturers, in a most graceful and appropriate speech, introduced Mr. Bain with whom he had formerly worked. About 500 heard a presentation which was recognized as of very high caliber.

Technical Activities of the Steel Treaters

There were 30 papers presented at the nine sessions of the A.S.S.T. during the five days. The various subjects at these sessions included heat treating of steel, deep etch testing, research, drop forging, sheet and strip steel, high-speed steels, and corrosion resisting steels. In this necessarily restricted report only a few of these are covered.

New Type of High-Speed Steel

A NEW type of molybdenum high-speed steel was described at the session on high-speed steels by J. V. Emmons, metallurgist, Cleveland Twist Drill Co., Cleveland. The new steel was announced as carrying about one-fourth as much tungsten as molybdenum, and as superior in many respects to the molybdenum high-speed steels previously examined. The other alloying elements are those commonly found in high-speed steels and in the usual proportions. The addition of an auxiliary amount of tungsten has been found to improve the microstructure and the strength, to make the plasticity more uniform and particularly to increase the cutting quality.

The statement that molybdenum will replace tungsten in high-speed steel in the proportion of one to two is much too broad, said Mr. Emmons. The behavior of the two elements is particularly different when both are present in the same steel. The original belief which led to the investigation has been confirmed—molybdenum high-speed steels have an individuality

of their own. It seems reasonable to predict, said the author, that molybdenum high-speed steels will find a field of usefulness in industry on their own merits.

Dr. John A. Mathews, vice-president, Crucible Steel Co. of America, New York, commented to the effect that his company has made various modifications of molybdenum high-speed steel, including tungsten, cobalt and vanadium. The general experience is that this steel is not as foolproof as the 18-4-1 type. On occasions it gives satisfactory results, but with more tendency to brittleness, particularly in lathe tools. It also seems to require greater skill in its heat treatment. He highly complimented the author's work.

The early experience of the Universal Steel Co., Bridgeville, Pa., according to Frank Garratt of this company, is that steels in which molybdenum entirely replaced tungsten were distinctly unreliable. As a result of experiments it was found that when tungsten was added in certain limited proportions, a reliable steel of considerable merit could be produced. A "base" composition was finally produced, fully equal to the 18-4-1 type, the base composition of the tungsten steels. The molybdenum and tungsten steel thus developed was briefly described in THE IRON AGE, June 9, 1932, and has a composition of carbon, 0.77; tungsten, 1.75; molybdenum, 7.75; chromium, 4.10, and vanadium, 1.05 per cent. This is quite similar to those in the author's paper, said Mr. Garratt.

The fact that independent workers have arrived at substantially the same result would indicate that steels of this type have considerable merit, commented Mr. Garratt. He added that it has been his experience that the cutting efficiency falls off rapidly as the carbon drops below 0.72 per cent; also, that the Mo-W steels now being marketed are hardened most satisfactorily at around 2175 to 2200 deg. F. "We are impressed with the possibilities of these steels," he declared.

Nickel in Nitriding Steels

RESULTS of an investigation of the part which nickel may play as an alloy in nitriding steels were made public in a paper, at one of the sessions on research, entitled "Rôle of Nickel in Nitriding Steels," by H. J. French, International Nickel Co., New York, and Dr. V. O. Homerberg, Massachusetts Institute of Technology, Cambridge, Mass. An abstract of this paper was published in THE IRON AGE, Oct. 6.

A written discussion by Dr. Leon Guillet, French Academy of Sciences, Paris, France, was read which was substantially as follows:

Since the initiation of the nitriding process, consideration has been given to nickel additions in steels containing chromium and aluminum to prove their mechanical properties. An appreciable improvement in the ultimate tensile strength and the elastic limit figures has been noted, but after nitriding the resiliency of the core is always greatly decreased, which phenomenon is attributed to temper brittleness. It was therefore natural to add some molybdenum, which element is known to have a favorable influence in avoiding such fragility. Actually, it has been noted that with up to 1 per cent of nickel, in the presence of 0.30 per cent molybdenum, the fragility of such steels is not increased during nitriding. For higher nickel contents the resiliency is diminished, although maintained within acceptable values. However, to date, nitriding steels containing nickel have been seldom used in France, although the decreased brittleness of the nitrided case in such steels has always been recognized.

Messrs. French and Homerberg have pointed out in a striking manner the favorable influence of nickel upon the strength of the core due to age-hardening during the nitriding process. The increase of the elastic limit and the tensile strength due to prolonged heating at about 500 deg. C. has not been sufficiently recognized to date, and to my knowledge, has not been profited by. This phenomenon is of great interest, permitting the ready machinability of pieces whose strength values are later increased during nitriding to such an extent that machining would have been extremely difficult or even impossible.

It seems to me that an addition of nickel in nitriding steels offers still another advantage, which is an increased penetration in quenching, and the ability to readily heat treat pieces of larger dimensions. In France, self-hardening steels of the following approximate composition limits are employed in certain cases for nitriding steels:

	Per Cent
C	= 0.20 to 0.40
Ni	= 2.50 to 3.00
Cr	= 2.50 to 3.00
Mo	= 0.30 to 0.60
Al	= 0.20 to 0.50

The carbon content varies in accordance with the application and the hardness desired after treatment. By varying the aluminum content, it is possible to regulate the hardness of the nitrided case, as well as the brittleness to some extent. After an air or oil quench and drawing at 500 deg. C., these steels have an ultimate tensile strength of from 150 to 160 kg. per sq. mm. (213,000 to 228,000 lb. per sq. in.) and a resiliency of 7 kg. on a Mesnager test piece. Heating for 60 hr. at 500 to 520 deg. C. lowers this resiliency figure by up to 25 per cent.

President and Vice-President for 1933

W. B. COLEMAN

W. H. PHILLIPS

Heat Treating Medium-Manganese Steels

ONE of the papers at the session on the heat treating of steel was entitled "Observations on the Effect of Normalizing Medium-Manganese Steels on the Microstructure and Physical Properties," by C. R. Austin, Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

The so-called medium-manganese steels are frequently referred to as "pearlitic manganese steels," said the author. The structure, whether in the "as rolled" or normalized condition, is sorbitic rather than pearlitic. The steels owe their strength to this fine sorbitic structure. The double normalizing treatment results in the formation of a very fine grain, an elimination of the banding structure, and in the rejection of free ferrite from the solid solution in small and well distributed particles. Comparing only the double normalizing values with the "as rolled" properties, the tensile yield is raised from 68,000 to 78,000 lb. per sq. in., by heat treating. Similarly the Izod values are raised from 4.5 to nearly 30 ft.-lb., and the fatigue values from 51,000 to 61,000 lb. per sq. in. The data are obtained from a study by the author of the effects of various normalizing treatments on the microstructure and mechanical properties of a steel containing 1.5 per cent Mn and about 0.40 per cent C.

The author brings out very emphatically the remarkable increase in ductility and resistance to impact of these steels when the double heat treatment is used, said A. Oram Fulton of Wheelock, Lovejoy & Co. of Boston, in discussing this paper. All of these steels are very much better when the regular heat-treating operation can be used, that is, a quench and draw, but where mechanical handling

makes this impracticable, the double normalizing treatment does undoubtedly materially improve physical properties.

The effect of the double normalizing on the machinability of the steel, continued Mr. Fulton, was not touched on by the author. This would be highly important to the manufacturer of small parts using bar steel. Probably investigation would show that double normalizing does improve the machining, which would undoubtedly vary, depending upon the temperatures used and the rate of cooling.

Gears Made of These Steels

Dr. Austin ably brought forth the vital fact that pearlitic manganese steels must be properly conditioned to obtain maximum service and life from the manufactured product, especially where shock and impact are involved, said Norman E. Waldman, metallurgical engineer, Westinghouse Electric & Mfg. Co. Gears and pinions made of these steels in the past were either annealed, normalized, oil-quenched or water-quenched. Proper conditioning of these steels was sadly neglected. Non-hardened gears and pinions were merely annealed at a high temperature, or released in the green state for finish machining. Such gearing would most assuredly fail after a very short period of service, and would disclose on microscopic examination at or near the fracture a coarse structure, ferrite banding and minute cracks. Due to low impact value the teeth would fracture out at the root, chip off, or sometimes split open. The better gear makers today specify that unhardened manganese steel gears and pinions must be either thoroughly annealed, followed by normalizing, or must be double normalized, followed by a low anneal or strain relieving draw to obtain the desired strength with the highest ductility and good impact value. These steels are very tough and rather treacherous, unless properly conditioned.

A double treatment, as recommend by the author, is not the only way to correct some of the shortcomings of these steels, said Jerome Strauss, research metallurgist, Vanadium Corpn. of America, Bridgeville, Pa. A modified composition with a single normalizing has not only accomplished the same purpose, but secured further improvement in tension test values. The modified composition is carbon 0.40, manganese 1.20, chromium 0.35 and vanadium 0.10 per cent.

Scaling of Steel in Heat Treating

At the same session a paper on "Scaling of Steel at Heat-Treating Temperatures" was presented by C. Upthegrove and D. W. Murphy, University of Michigan, Ann Arbor, Mich. The authors present results of an investigation of the relative scaling effects of atmospheres of air, carbon monoxide, carbon dioxide and water vapor on steel over a temperature range of 1000 to 2000 deg. F. It is shown that scaling does not increase regularly with increase in temperature in the simple atmosphere (air), oxygen and carbon dioxide. A maximum and a minimum point are observed for carbon dioxide at 1400 to 1520 deg. F., and for air at 1800 and 2000 deg. F. A very definite retardation in the rate of scaling in oxygen is also observed at 1800 deg. F., the temperature at which blistering first becomes noticeable in both air and oxygen. For temperatures below 1700 deg. F., very little scale is produced by combustion atmospheres carrying four or more per cent of carbon monoxide.

In discussing the paper, O. W. McMullan, Timken-Detroit Axle Co., Detroit, pronounced the subject one of practical interest to every heat treater of steel. A comparison of the curves in the paper for carbon dioxide and air shows the tendency toward much greater scale loss with excess air from improper burner operation above 1500 deg. F. Use of air as a cooling medium to hasten certain annealing operations from 1700 or 1800 deg. F. to around 1300 deg. F. can be expected to show much greater scale loss than that occurring from ordinary combustion gases.

Loss Due to Scaling

Until recent years comparatively little attention has been given to the large financial losses from the loss of steel in scaling, and other subsequent heavy costs in descaling, in addition to which is the heavy expenditure on cutting tools, etc., when machining badly scaled materials, particularly forgings, said H. H. Ashdown of the Westinghouse company. In the high-carbon and chromium alloy steels, where scaling is more rapid and often more difficult to remove, the loss and expense are relatively greater. In the lower range of heats, say up to 1600 deg. F., which would cover the heat treatment on a wide range of steels for annealing or quenching treatments, it is questionable whether the controlled furnace atmospheres by dilution of the active gases and retarding combustion would not slow down the rate of heat penetration. Under those conditions the restricted rate of output may offset the saving, due to oxidation. The subsequent losses, however, must not be lost sight of.

Macroetching as a Testing Method

AT the session on deep-etch testing four papers were scheduled, one of which was "Development and Application of Macroetching," by H. G. Keshian, Chase Companies, Inc., Waterbury, Conn. Mr. Keshian, after reviewing the development of etching iron and steel from early days, suggests that the recommended practice of the A.S.S.T. be more closely followed, and that graded standards for some of the principal types of etch structures be established. Photomicrographs illustrating this are given in the paper.

W. H. Mills, Ludlum Steel Co., Dunkirk, N. Y., in discussing this paper, testified that macro or deep acid etching has become increasingly important in recent years as a method of testing tool and special alloy steels for internal, and in some cases, surface defects. Records of this company for about three years show that, of the routine tests going through the laboratory, 15.5 per cent are deep etch tests representing about 300 tests per month, with rejections of only about 5 per cent.

H. S. Rawdon of the Bureau of Standards, Washington, said that he did not think Mr. Keshian has sufficiently stressed the practical application of the inherent possibilities of the method. The methods used by Stead, Fry, Rosenhain and others, which depend on the use of an acid solution containing copper in some form, are still of great practical importance for studying the distribution of phosphorus and other impurities,

New Directors for 1933

R. S. ARCHER

H. G. KESHIAN

as in the banding of steel. Other copper solutions are of very great value in the insight they give us as to the internal condition in strained low-carbon steels. While it is recognized, said Mr. Rawdon, that the need of close control of the conditions of testing is not so vital, as is the case in some other lines of metal testing, the author's plea for standardization of conditions for macroetching has "my full support."

Etch Test for Tool Steels

Another paper at this same session dealt with "An Interpretation of the Deep Acid Etch Test as Applied to Tool Steels," by J. P. Gill and H. G. Johnstin, Vanadium Alloys Steel Co., Latrobe, Pa. The authors dealt with this test as applied specially to tool steels. The effect of various acids on the structure and on the rate of solubility is discussed, and there is briefly described the common characteristics which are developed by the deep acid etch, and how these characteristics can be distinguished one from another.

Both this and Mr. Keshian's paper were discussed by J. J. Curran of New Britain, Conn. He said that both papers are cautionary. Mr. Keshian, he asserted, notes that the quality of tool steel has improved greatly as a result of the use of the deep etch. Messrs. Gill and Johnstin illustrate the effects of different reagents, and point out the failure of the most commonly used reagent when applied to some special steels, and to some conditions of heat treatment. Deep etching is not a closed book, nor is it any more fool-proof than other methods of metallurgical investigation, he stated. It furnishes a maximum of information with a minimum of effort. "If properly applied," said Mr. Curran, "there is little reason to be apprehensive of results."

The adoption of standards should not be permitted to stifle progress. The paper by Gill and Johnstin, while an argument for standardization, is at the same time conclusive proof of the need for flexibility, and emphasizes the need for further investigation into reagents for special steels and for the various heat-treated conditions, he added.

An Attractive Exposition

MANY exhibits of new equipment and products were shown at the National Metal Exposition. While the number of exhibitors was less than in recent years the quality of exhibits aroused much favorable comment. The new exhibits indicated that in the past year many companies have gone ahead with new developments.

Many exhibitors commented that more interest was shown in the displays by visitors who might be classed as prospective purchasers of equipment than was shown by the same class of visitors at the Boston show.

A new feature of the show was the award of three silver cups for the most interesting displays, judged by the general appearance and the presentation of the exhibitor's product. The prizes were authorized by the board of directors and the awards were made by a committee of five judges, named by the mayor of Buffalo, consisting of three engineers and two advertising men, none of whom was a member of the A. S. S. T. The first prize was awarded to the Jones & Laughlin Steel Corpn., the second to the Air Reduction Sales Co. and the third to the Grasselli Chemical Co., the latter company exhibiting for the first time. The committee decided that three other exhibits were entitled to honorable mention. These were those of the New Jersey Zinc Sales Co., the Superior Steel Corpn. and the Carborundum Co.

There was an extensive exhibit of welding equipment, including several arc welding machines of new design which were demonstrated. These indicated an increase in simplicity and flexibility, and an improvement in efficiency. Some of these machines were designed for a wide welding range to permit the use of small and large electrodes and the welding of thin and heavy sections on the same machine. One was a 300-amp. machine which can be cut down to 20 amp. with a 20-volt arc for use with a 1/16-in. electrode and having a maximum of 400 amp. with 40-volt arc. Another had an adjustable striking voltage and a range in welding current of from 50 to 500 amp.

A machine designed for use in a new and unique process for welding longitudinal seams attracted much attention. The rod is laid down flat along the side of the weld and a series of arms contact with the welding rod at intervals of about 12 in., the coating being bared at these spaced intervals. The current is distributed through the entire length of the rod. One portable arc welder was mounted on a trailer for hitching to the back of an automobile.

New electrodes were exhibited by several makers. These indicated a tendency toward the shielded arc type. Welding wire and various welding accessories were also included in many exhibits. Gas welding equipment was well represented. One was a new torch having two sets of needle valves, permitting adjustment for two separate flames.

Cutting equipment, demonstrated by several makers, included an automatic traveling machine for cutting small or large shapes. The outstanding feature is that the torch will travel over any part of a rectangular area and will cut any shape on a piece 10 ft. wide and 28 ft. or more in length.

Rustless steels in rolled form and in bright finished products were shown in attractive displays, indicating an increase in the breadth of application for various commercial uses. In one exhibit was a rustless steel sheet 156 in. long, 60 in. wide and 1/4 in. thick, which was said to be the largest of this type ever rolled. These displays included many attractive fabrications, largely for decorative art and architectural work, among them panels, columns, architectural trim and grilles. What can be accomplished in etching and otherwise decorating these high-luster steels was also artistically shown. There were also attractive displays of cooking utensils made of rustless iron and steel. Quite conspicuous also was a large exhibit of mechanics' tools made of stainless steel in a wide variety of products.

The display of steel products included heat-resisting material, tool and spring steel, cold-drawn steel in welded pipe and shapes, shafting, wire and various other steel mill products.

Industrial heating equipment displays included newly designed furnaces and burners. A new diffusion burner for a forging furnace is so arranged that a high rate of heat transfer is effectd through radial energy preventing air from getting to the work. Wide flexibility is a feature of a new bell-type retort furnace designed for gas carburizing, nitriding and bright annealing, using hydrogen or inert gas. A new gas-heating molding platen for use in making and baking Bakelite and similar products was exhibited. The feature of this is an even distribution of gas over a large area and with a very low gas consumption. The heating is done by radiation from refractory tips.

The use of the electric eye as a fully automatic temperature-controlling device was applied to a forging heater. The piece, fed from a hopper, is delivered to the forging machine after reaching the proper temperature, the work of the attendant being limited to seeing that the hopper is kept filled. Another application of the electric eye for controlling temperature was on a machine for heating the end of valve stems.

Many Types of Castings

The casting field was represented by a very extensive display of heat and corrosion-resisting castings and non-ferrous castings. Zinc die castings included numerous specimens of castings used in the automotive and other fields and indicated the progress that has been made in the manufacture of die castings. Among the samples that attracted attention was a spark plug cover for airplanes having a wall thickness of less than 0.020 in. Aluminum-bronze die castings also were shown for a wide range of uses. A malleable iron foundry exhibited bolts, hammers and pipe wrench handles made of a special malleable iron.

A spectrograph adapted for the analyses of iron and steel, especially alloy steel, was on of the interesting exhibits. The display of testing machines included a new low-capacity machine for testing low tensile strength material, a new impact testing machine being a combined Izod and Charpy machine, and a portable Brinell testing machine.

Welding of Heavy Equipment Reviewed at Buffalo Meeting

USE of welding in building heavy machinery, large pressure vessels and other sizable equipment was among the topics of the comprehensive program of the twelfth fall meeting of the American Welding Society, held at the Statler Hotel, Buffalo, Oct. 3-6, during the week of the National Metal Congress.

Technique of welding and cutting was dealt with in various papers and some recently developed welding and cutting facilities were described. Reports of four or five research investigations were discussed. In addition to the 25 papers at the seven technical sessions, the annual banquet, plant inspections and the National Metal Exposition, which included several exhibits of welding and cutting apparatus and supplies, were features of the convention. All sessions were well attended.

Steel Industry Using Welded Equipment

INCREASING use of welded steel in the construction of equipment for the iron and steel industry was shown by Christian A. Wills, general manager, William B. Pollack Co., Youngstown, in his address on "Welded Rolled Steel Design for the Iron and Steel Industry."

Adoption of such designs has been marked by short successive steps, many of which have guarded against failure by ingenuity in design, thus giving the weld an opportunity to prove its worth and safety—yet not depending entirely upon it, said Mr. Wills. Actual tests and accumulated proof that such designs are safe and their adoption advantageous, have heightened interest in welding and made it necessary for manufacturers supplying equipment for the iron and steel industry to include consideration of welded construction in their plans, he stated.

Oxyacetylene cutting was also given credit for improved designs; without the torch, welded products of heavy material could not be manufactured economically. Imagine what this method of cutting has meant to our industry, he said, when prior to its introduction, 2-in. was considered a heavy plate and it was necessary to make openings in hearth jackets, etc., by drilling or punching small adjoining holes, and, after removal of the large piece, to chip with pneumatic tools the projections remaining between the holes.

FRANK P. McKIBBEN, consulting engineer and president of the American Welding Society, who was awarded the Samuel Wylie Miller Memorial Medal in Buffalo last week, in recognition of his work in the development of welded steel structures.

By that method such work took hours to do; with the torch it can now be done in minutes. Where 2-in. was considered heavy plate, it is now common to see 8, 10 and 12-in. slabs and billets burned into pieces for fabrication by welding. Machines have been developed that cut these thicknesses to curved or straight lines with surprising accuracy. With the aid of such torches and electric arc welding, we have produced welded rolled steel designs having decided improvements, Mr. Wills said.

Open-hearth ladles with capacity for 85 tons of hot metal have been built, the welded steel design weighing 21,000 lb. less than the riveted ladle with cast steel trunnion and spacers. In addition to lighter weight and lower first cost, the welded steel ladle, it was said, will cost less to operate, as crane handling charges will be lower. The welded steel ladle also has the advantage of being perfectly smooth inside.

Hot metal cars and ladles of welded construction have also been built. A cast-steel riveted car and ladle of one design weighs 190,000 lb., and has capacity of 115 tons. The welded rolled steel car and ladle has a capacity of 140 tons, and, with its tilting mechanism, weighs some 10,000 lb. less.

Rolled steel has also been substituted for castings in the 75-ton capacity hot metal cars and ladles. The cast steel construction weighs 106,000 lb., the rolled steel, 94,000 lb.

To assure maximum safety in case of weld failures, mortise and tenon construction, secured by inserting projections of one member into slots cut in other members, has been employed. Weld failures have been negligible, however; as a result more reliance is placed in the weld and every new model has more welding embodied in its design.

Columns and base plates for blast furnaces, if made of cast iron, riveted structural steel and welded rolled steel, and designed for equal strength, were said to compare in weight as follows: Cast iron column, 15,110 lb., structural steel, riveted, 10,180 lb., and rolled steel column, welded, 8260 lb.

Welded steel applications in blast furnaces include tuyere jackets, gas seal hoods, receiving hoppers, downcomers, cold and hot blast mains and gas mains. In all cases savings were said to result. Stainless steel tinplate annealing boxes are being tried out to obtain a comparison with existing boxes of rolled mild steel. Both are of welded construction, which is preferred, it was said, because such boxes retain their shape longer and remain tight and free from leakage. The welded boxes were said to withstand from 250 to 300 heats before having to be discarded because of distortion. Pans for holding 40,000 lb. of molten spelter, and two-compartment lead pans made of 1⅛-in. plates, were among other welded constructions described.

Ore Dumper Parts Made of Welded Steel

THE part that welding has played in the building of ore unloaders, car dumpers, gas producers and other heavy machinery built by the Wellman Engineering Co., Cleveland, was interestingly outlined by A. E. Gibson, vice-president of that company.

Much of this equipment is built to special needs. Large savings have been made through use of welding, particularly on single jobs where pattern costs would be high. Savings

have also been made on small units, such as levers, etc. Serviceability as well as saving in weight is an objective, and serviceability is never sacrificed to weight reduction. Welding labor is comparatively expensive, it was said, but this is offset by savings in patterns, core boxes, cost of storage and protection of patterns and other sulted in a saving of 1500 lb., which cases an advantage of welded steel design.

Welded steel parts shown by slides included the centerpiece for a very large telescope, a large cylindrical shell welded to steel I-beams and angles, which themselves, were fabricated of welded steel. This, with a mirror cell of welded construction, resulted in a saving of 1500 lb., which saving in weight was the object of using the welded design.

Builds Large Mooring Masts

Winches, engine bed plates, trucks and other welded steel members of a mobile airship mooring mast, for use at Lakewood, N. J., were described. This mast, of telescoping type, is 160 ft. high when the airships are moored to it. The movable telescoping sections were made of high carbon silicon steel, and were not welded. The mooring winch, mounted on the mast, weighs 25,000 lb. and was entirely welded. The bed-plate for the 565-hp. gas engine was also welded, and with the motor running at full speed there is said to be no vibration.

Welded counterweight brackets for revolving car dumpers featured simplicity of design, little work being required to prepare for welding and a minimum of machining. Welded steel two-car dumper beams have been in use for more than six years without one case of breakage. The saving in weight on these is more than 200 lb.

Other welded parts include 12 ft. diameter gas producer top plates, all of which are of welded steel except for the coke hole castings. The piece weighs 6300 lb. In use the bottom of this part is subjected to a temperature of about 1500 deg. F. and top is water-cooled. The main columns and auxiliary columns that support this top plate have been redesigned for welding, with a substantial saving in weight. A 3-yd. drag-line bucket combines steel plate of various analyses, castings and riveted steel. Weight reduction was the object of this design. Open-hearth charging machines having all-welded end carriages and girders were illustrated and described; these have been in severe heavy-duty service for more than three years.

Herring-one gears for various uses are made of welded steel. A 32½-in. diameter, wide-face pulley used on a cold saw for cutting pipe in steel mills was of interest. This pulley operates at very high speed; its web-plate is welded both inside and out.

Discuss Stress Relieving by Peening

Following Mr. Gibson's address, the question of stress relieving by peening was discussed. James W. Owens, consulting welding engineer, Portsmouth, Va., said that residual stresses may be greatly relieved by a proper peening procedure. This can be demonstrated in a test specimen by the absence of warping and by strain gage measurements.

While peening is extensively used, the technique involved is not generally understood, he said, and there is much yet to be learned before consideration could be given to its general substitution for thermal stress relieving on structures wherein failure would involve the loss of life or property. He stated that he has successfully used peening in connection with various types of structures and considered its use to be essential in many cases. To illustrate the danger involved when its proper use is not understood, he cited experiments wherein he has caused a butt weld in 1½-in. plates to fail transversely, failure extending into the bar metal on both sides of the weld.

Welded Vessels with Walls 3-In. Thick

Examples of welded products built in accordance with the A.S.M.E. Code for Classes 1 and 2, were described by P. R. Hawthorne, welding engineer, Struthers-Wells Co., Warren, Pa., in an address on "Application of Welding to Pressure Vessels."

One of these was a vessel for handling liquids which remain in liquid state solely by being confined under their own vapor pressure. The service is extremely hazardous. Any leakage or failure might result in enormous property damage and loss of life through fire and explosion. The vessels are about 7 ft. inside diameter, 39 ft. long and the shell and heads are of plate 1-in. thick.

The process used was Struthers-Wells "tempered arc" or coated electrode, the welding being done in a gaseous sheath to prevent contamination of metal while in vapor or highly liquid state, and through a combination of chemical reactions and metallurgical changes produces welds with properties which far exceed Code requirements.

After the welding was done the seams were explored by X-ray. This included every foot of longitudinal and girth seams. These films, placed end to end, constitute a panoramic view of each seam, and are a permanent record of the quality of the welds.

Before the hydrostatic test was applied, each of these vessels was placed in a furnace built for stress relieving vessels, brought up slowly to 1200 deg. F. and held at that temperature for 1¼ hr., then allowed to cool slowly in the furnace to about room temperature. Inside dimensions of this furnace, which is of car type, are: 13 ft. 3 in. wide, 15 ft. 3 in. high and 82 ft. 4 in. long. The temperature is automatically controlled within close limits at 40 different points in the furnace. Eight charts record the temperature and time throughout the annealing operation; these become a permanent record.

Vessels 8 ft. inside diameter, 45 ft. long, made of plate over 1 in. thick were also illustrated. These are for oil refining service. The oil industry, it was said, was the pioneer user of electric welded vessels.

A welded vessel 5 ft. inside diameter with walls 3 in. thick was also shown. Test pressure of 2000 lb. per sq. in. was applied, and the vessel is now in operation under varying intermittent pressures up to 900 lb., the rise and fall of temperatures occurring almost instantaneously.

In speaking of the gas torch, Mr. Hawthorne pointed out that without the torch, preparation of plate over 2-in. thick would be very expensive, and preparation of many irregular pieces of welded vessels would be impossible.

Cutting Torch Important in Car and Locomotive Scrapping

COMPREHENSIVE data on the methods and equipment used in scrapping obsolete railroad cars and locomotives were given by W. H. Ludington, manager, applied engineering department, Air Reduction Sales Co., New York, in a paper on "Oxy-acetylene Cutting as Applied to Railroad Car and Locomotive Scrapping."

Extensive scrapping programs are usually carried out in central scrap and reclamation plants. There is a wide variation in the correct scrapping procedure for the many different kinds of cars. Cuts to be made with the torch depend largely upon the shop equipment also. If shears are available the car sides and ends need only to be cut to a size which can be handled under the shears, which reduces the larger pieces to charging box size.

Both cars and locomotives may be scrapped in position by completely demolishing them in one location, or by the line method, moving them along from point to point until the operation is complete. The scrap is usually cut and sorted to agree with A. R. A. classifications. Many parts are salvaged and re-used for repairs or new equipment.

One scrapping program for 2000 cars was said to have produced 29,729 tons of salable scrap and 1888 tons of recovered material in usable condition, or approximately 6 per cent by weight. In addition, 400,000 board feet of usable lumber was secured.

The average weight of classified scrap obtained per car, for various

types of cars, as compiled by the A. R. A., was given as follows:

Composite gondolas, flat hopper bottom, steel center sills	21,295 lb.
Composite gondolas, flat bottom drop ends, steel center and side sills	31,442
Hoppers, all-steel	35,010
Flat cars, steel center sills	20,140
Gondolas, all-steel, twin hopper bottom	38,970
Single sheath box cars, steel frame and steel underframe	29,358
Double sheath box cars, wood body and steel center sills	22,446

With locomotives and tenders, practically the entire gross weight is obtained as classified scrap and recovered material.

In dismantling cars, 141 cars per month were handled by one railroad operating a central scrap and reclamation department. Average cost per car was $25.77, and the value of gases used per car was $9.34. Men engaged numbered 19, and number of man-hours per car was 24.

In dismantling locomotives in a central department, one railroad reported output of 28 per month, at an average cost of $134.71 per locomotive. These and the previous figures are from data collected by the A. R. A.

Average gas consumption per car for scrapping, from data collected by the authors, was said to range from 300 cu. ft. of oxygen and 70 cu. ft. acetylene for wooden box cars to 1150 cu. ft. of oxygen and 290 cu. ft. of acetylene for all-steel gondolas.

Comparative cost data for car scrapping, as secured by the A. R. A. from a railroad which scrapped 2190 cars, were cited in part as follows: Total costs per car ranged from $21.21 for flat cars to $35.93 for all-steel cars. Average scrapping costs for all cars were: Labor, $21.08; material, including gases, $12.33; giving a total of $33.41.

Data collected on locomotive scrapping indicates an average cost of approximately $1.30 per long ton for labor and materials, including gases.

Gas Cutting Process Developed for Rough Machining

A significant new development in oxyacetylene cutting was presented by H. H. Moss, Linde Air Products Co., New York, in a paper on "Conditioning, Shaping and Machining of Carbon Steel with Oxygen."

Until the past few years, oxyacetylene cutting has been used as a severing tool. To this usual cutting is being added a "tangential" cutting operation, which, it was said, does not cut through the metal but slices a groove somewhat in the manner of a milling cutter. The process was said to generalize into "flame machining," and to break down into various applications of rough machining, such as flame planing, flame milling, flame turning, flame punching or drilling, and flame boring. Not all of these have commercial application at this time.

The effort to refine the tolerances in normal cutting has shown very good progress, the cross-cut tolerances being said to be a few thousandths of an inch on material 2 in. thick. Rough flame planing to ¼ in. or ⅛ in tolerance was said to be near at hand. The process also permits longitudinal fillet cutting, greatly widening the general field of flame cutting. A manual application of flame machining has been in use in steel mills for deseaming billets en route to rolling mills.

The nozzles used in flame cutting are those that are standard today either for normal cutting or deseaming. The normal cutting nozzle uses high cutting oxygen velocity, but flame machining is a relatively low velocity operation.

Asked if drilling was possible, Mr. Moss said that it was being worked on, the endeavor being to make a hole in somewhat the same manner as an ordinary punch, in distinction to the line cutting of a hole. A cutting data chart, based on volumetric displacement rather than on the usual "feet of welding per hour" was an interesting part of the paper.

It is expected that this new development in oxyacetylene cutting will aid in rough machining and shaping steels, particularly higher carbon steels.

Machine Welding with Heavily-Coated Electrodes

A recently introduced automatic head for production welding with heavily-coated electrodes was described by L. R. Leveen, welding engineering department, General Electric Co., in a paper on "Automatic Welding with Heavily-Coated Electrodes."

The welding head is of magnetic-clutch type of suitable size and strength for the heavier duty, and with the multiple drive rolls and current conducting unit forms one piece of equipment, which is mounted on a standard travel carriage. The electrode is furnished in 150-lb. coils which are placed on a demountable reel. It is fed from the reel through multiple feed rolls, which engage it on the outer surface of the flux coating, past a high-speed cutter which removes a portion of the flux material, thus exposing a smooth, bright contact surface on the base wire. The electrode then passes through the current-conducting unit, which comprises five sliding contacts backed up by three pressure rolls to keep the electrode in alinement. From this point, the electrode passes through a short guiding nozzle to the arc. It can be oscillated, if desired.

Feeding of the electrode through multiple feed rolls is said to permit very close arc control for any particular voltage setting. Changes in set-up may be made conveniently.

Discusses Arc Welding of High Nickel Alloys

ELECTRIC fusion welding of monel metal, nickel, Inco chrome nickel and nickel clad steel was discussed by J. G. Schoener and F. G. Flocke, International Nickel Co., New York, in a paper on "Welding High Nickel Alloys."

Welding was said to be one of the soundest and most rapid methods of joining these alloys. Properly made welds should duplicate in strength, soundness and ductility those of ferrous and readily welded non-ferrous alloys.

The character and uses of these corrosion-resisting metals were outlined. Coated rods were used as early as 1922. In 1929 an advance was made in the form of a coating having titanium and calcium as the active ingredients. More recently there has been developed a new heavily fluxed rod which produces welds of high ductility and toughness in all three metals with excellent soundness and strength. In these rods, one group of constituents serves to stabilize the arc and provide a protective coating on the deposited metal. Another group so controls the plasticity of the coating that a flux shield is always maintained beyond the end of the welding rod. A third group serves to deoxidize and otherwise purge the molten metal of impurities. A further factor of safety is said to be provided by an element in the flux to combine with oxygen at the elevated temperatures of the arc. Ferro-titanium has been retained in the present flux because of its highly reducing character. In operation, this flux is said to make for a high rate of deposition.

In using these welding rods, reversed polarity under all conditions is desirable. Generally a lower heat than would be used with the older type of monel metal and nickel rod is recommended. In welding nickel alloys, the molten pool of metal should be quiet and not boiling.

Welding Nickel-Clad Steel

Interest was shown in the welding of nickel-clad steel plate, which is a flanging quality steel with a cladding or veneer of pure nickel permanently bonded to the steel on one side. It is made in thicknesses of 3/16 in. and over with the nickel cladding from 10 to 20 per cent of the total thickness of the plate.

This bi-metal is used in large equipment where a corrosion-resisting surface is needed and where the cost of a solid corrosion-resisting metal would be prohibitive. Two 8000-gal. railroad tank cars of this material are now in service for transporting pure caustic to rayon plants.

For a butt joint, the bi-metal is V'd and welded from the steel side with a steel welding rod. The weld metal at the base of the "V" is gouged out

from the under side, to clean the seam of icicles and oxide, and so present a clean groove with which the nickel can be welded. Then a nickel welding rod is used to join the nickel edge, so insuring a continuity of nickel at the seams. With corner welds, the steel is again welded first, then the nickel, but here no chipping is necessary.

Purity of weld laid on the nickel side is important, and therefore the possible deleterious effects of iron in combination in the nickel were given consideration. It was found that with even as much as 20 per cent iron in an iron-nickel alloy, the resistance to attack by aerated 50 per cent sulphuric acid at 20 deg. C. was decreased only 20 per cent. With caustic soda the effect of iron was of even less practical importance.

Analysis of nickel weld metal was said to show the iron pick-up to be of reasonable proportions, but can be kept at a very low figure by care in design and fabrication.

Thyratron Control for Resistance Welders

Applications and advantages of thyratron control for resistance welding were outlined in an address by W. C. Hutchins, General Electric Co. This device was developed for closing and opening an electrical circuit which determines the time power is applied to the welding machine.

In discussing range of operation, Mr. Hutchins said that this control equipment operates satisfactorily up to 1800 interruptions per min. on a 60-cycle power supply. This means that the "on" period and "off" period include only one cycle each. By simple adjustments of snap switches and variable resistance dials the speed of operation can be changed to give any number of cycles up to 40 or more for the "on" period and an equal or different number for the "off" period.

By using higher frequency, say 120 cycles, it is possible by welding with one cycle to get the equivalent of only ½ cycle of the 60-cycle supply, it was said. Or, it is possible on this higher frequency to get a maximum of 3600 interruptions per min., each impulse having a duration of 1/120 sec. Should 240 cycles be used, a maximum of 7200 interruptions per min. are practical, he said.

Standard apparatus is now available for controlling welders up to 350 kva., but the control can be made suitable for loads up to 700 kva.

Welding of stainless steel is being done by this control in both production and experimental shops without discoloration on the surface of the pieces welded. It is believed that application of the control is an important factor in solving the problem of spot welding Dow metal.

Advantages claimed by the Thyratron control include wide capacity range, flexibility, exact duplication and noiseless operation. There are no moving parts, contactors have been eliminated, and construction is rugged. Tubes are said to have an average life of 10,000 hr., or the equivalent of more than 365 24-hr. days.

Advocates Selling Welding to Man in the Street

United effort of all branches of the welding industry in educating ultimate consumers to regard welding as a basic technical process was advocated by T. C. Fetherston, Linde Air Products Co., New York, in an address on "Selling Welded Products."

Welding has a very real place in American industry, in reclamation, production and construction, he pointed out. Advertising of welded products should emphasize the advantages of the welding processes. All the desirable features that recommend welding to the manufacturer could be made known to the ultimate user of his product.

Research in welding continues to be a major activity of the society. Four papers bearing on fundamental problems featured a well-attended session held under the auspices of the American Bureau of Welding, the research department of the A. W. S. Subjects included: the X-ray determination of stresses in welds; metal deposition in electric arc welding; corrosion fatigue study of welded low-carbon steel, and distribution of stresses in welded double-strap joints. A conference held under the auspices of the fundamental research committee of the A. B. W. attracted a number of university research workers. It is understood that 37 fundamental research investigations in welding are now under way.

Other papers at the meeting included one on the "Chemistry of Low-Carbon Metal-Arc Weld Metals," by J. C. Hodge, Babcock & Wilcox Co.; the "Metallurgy of Welds," by J. C. Holmberg, Struthers-Wells Co.; "Load Test on a Welded Roof Truss," by C. H. Jennings, Westinghouse Electric & Mfg. Co.; "Lead Burning or Welding," by R. L. Ziegfeld, Lead Industries Association; and "Automobile Repair Welding," by A. F. Keough, Sound Welding Co.

Four-Position Turret Stop for Vertical Miller

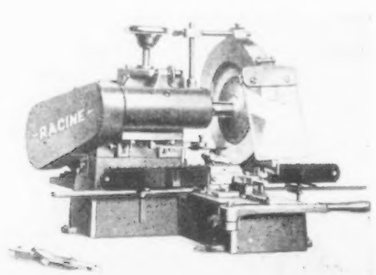
A new four-position turret stop and dial indicator arrangement has been developed by the Cincinnati Milling Machine Co., Cincinnati, for use with its new design Nos. 1, 2 and 3 vertical millers. The device provides quick, accurate setting of the spindle to various positions for step milling, and permits performing jig boring and die sinking operations more advantageously on the knee- and column-type millers.

The turret with four adjustable stops is easily turned by hand in either direction. With this arrangement power feed to the head is disengaged automatically when the different stops strike the plunger at the time the cutter is within a few thousands of desired depth. Final setting is made by hand.

Machine for Regrinding Hack Saw Blades

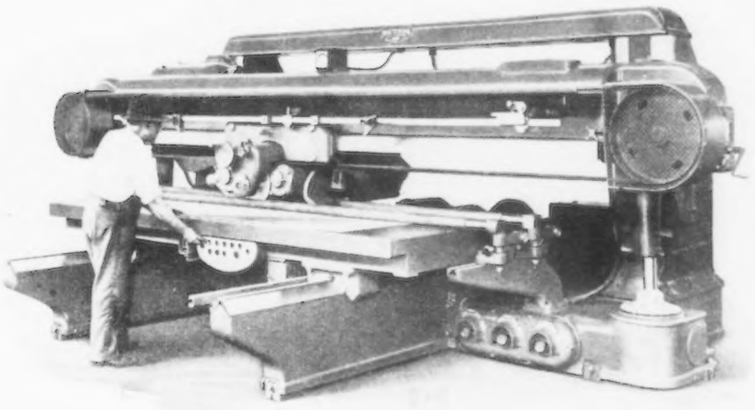
THE Racine Tool & Machine Co., Racine, Wis., has added to its line a blade grinder for regrinding high-speed steel power hack saw blades of all standard widths and lengths. It is stated that each blade may be reground from three to six times. Simplicity and ease of adjustment are features emphasized.

Provision is made to maintain correct tooth shape. Proper vertical and horizontal alinement of the grinding wheel is provided through adjusting screws, and the wheel is also locked in position by special studs. The blade itself is held in such position that teeth are slightly undercut. The wheel remains in a fixed position and the blade is fed across it. This, with the proper wheel speed and correct abrasive, is said to do away with burning of metal in the blade and to produce a clean, sharp grind.



Indexing is positive. The gage used to advance the blade has double fingers, which provides positive advance of the blade at every stroke of the operating handle, even when three teeth are missing at any one point of the blade. These indexing gages are available for blades with 4, 6 or 10-teeth per inch. After the machine is set and the wheel dressed and adjusted for a given size of pitch of blade, similar blades may be reground in from 1 to 1½ min. each.

A 7-in. diameter grinding wheel, ¼ or ⅛-in. wide is used, and means are provided for dressing the wheels to the angle corresponding to the pitch angle of the teeth in the blade. The machine is driven by a ¼-hp. motor and has a spindle speed of 2900 r.p.m. It is 22-in. long, 22-in. wide and 14-in. high. With motor, it weighs 90 lb.



Abrasive-Belt Steel Sheet Surfacer Has Water-Cooled Table

FOR the surfacing and polishing of steel sheets, including those of stainless steel, the Mattison Machine Works, Rockford Ill., is offering the new machine here illustrated.

Factory-made, flexible abrasive-belts are used. The entire face of the belt does active work, and the belts, in being over 40 ft. long, are said to allow time for individual grains to cool off between cuts. Maximum cutting efficiency is attributed to flexing of the belt around the contact roll, uniformity of abrasive surface, and the provisions made to enable working with heavier cutting pressure.

On the upright columns of the machine is mounted a heavy cross rail which has tracks on which the carriage travels. A motor in the carriage head drives the contact roll, which in turn drives the belt. The large idlers at each end of machine are provided with adjustments for alining and tensioning the belts. The belt in passing over small rubber covered idler rolls on the carriage head is flexed around the contact roll. This flexing, it is stated, not only increases the driving power, but aids in dislodging loose particles between the abrasive grains, and also improves the cutting action of the abrasive.

The grinding head is mounted on ball bearing rolls and is reciprocated from end to end of the work by means of a motor in the left-hand end of the main cross-rail. Stops are provided to govern the reverse according to the length of the sheet.

The table, a massive hollow casting, is cooled by means of water that circulates within it. Mounted on ball-bearing rollers, it travels on heavy steel-faced V-tracks. The table has power movement, actuated by a screw driven by a reversible motor at the rear.

The spring-loaded, cushioned hold-down rolls, one near each side of the belt, hold the sheet firmly on the table, and the cut is made between these rolls. Adjustment of the main cross-rail on the columns is effected by a hoist motor, and an indicator graduated in 0.001 in. is provided to facilitate its close settings for different thicknesses of sheets. The cut is regulated by a fine adjusting screw in the carriage head. Dust is removed by a suction fan through a cast chute in the carriage frame and flexible conduit.

In operation, the carriage reciprocates, bringing the contact roll into play on the work from end to end of the sheet, and the table moves slowly crosswise, bringing the whole width of the sheet under the roll. The sheet is thus stroked over its entire surface, and as many passes as necessary can be made. Limiting the cutting member to a short contact traveling rapidly over the surface is emphasized as making for efficient cutting action without generating undue heat. The water-cooled table rapidly carries away whatever heat is generated, making it possible to take unusually heavy cuts without burning the sheet. Stock removed is said to be in the form of shreds or shavings, showing a clean cut.

By removing the belt and contact roll, Tampico brushes, buffing wheels or polishing wheels can be applied to the machine.

Compact Light-Weight Electric Hoist

THE high-lift electric hoist recently brought out by the Philadelphia Gear Works, Philadelphia, in sizes from ¼ to 3 tons, inclusive, is compact, light in weight, accessible, and noiseless in operation. It is of heavy-duty construction throughout, and all parts are interchangeable.

Standard electric motors, Timken roller bearings, nickel-bronze worm gears, nickel-steel worm with hardened and ground threads, and nickel steel heat-treated helical gears are employed. The operating mechanism is inclosed in an oil-tight, dustproof casing and lubricated by oil bath.

Cable drums are of large diameter and have accurately machined grooves. Hoist cables are of non-spinning type. Forged steel hooks and ball-bearing hook swivels are used. Trolley wheels are of hardened steel, and are mounted in ball bearings. The hoist swivel trolleys turn on a 4-ft. radius.

Close control of loads, by push button operation, is a feature, and an automatic reversing upper limit hook stop is provided. No load brake is necessary. The hoist is of balanced design and the load is always under exact center of the rail.

Capacitor Motors

AS a supplement to its other lines of single-phase motors, the Century Electric Co., St. Louis, is offering a line of capacitor motors in sizes from 1/6 to 10 hp., furnished for single or multi-speed operation with normal torque, high torque or low torque characteristics, to meet the requirements of each application.

The small sizes have the capacitor box mounted on the top of the motor, although the boxes can be furnished for wall mounting as in the larger sizes. The internal sizes have a separate capacitor box, which may be furnished for either wall or floor mounting. Operating characteristics cover a wide range of applications, from the direct-connected fan to the more exacting service required for oil burners and refrigerators.

R.F.C. Agrees to Lend $62,000,000 for San Francisco Bay Bridge

Project Will Require 170,000 Tons of Structural Steel and 20,000 Tons of Reinforcing Bars

WASHINGTON, Oct. 10.—Estimated to require 170,000 tons of structural steel and wire, 20,000 tons of reinforcing bars, large quantities of pipe and $1,500,000 worth of construction equipment, the San Francisco Bay bridge, is by far the largest self-liquidating project for which the Reconstruction Finance Corporation has approved a loan. It agreed to purchase $62,000,000 of California bonds and the State will furnish the remainder of the funds with which to proceed with construction of the bridge, which will cost about $70,000,000 and will be the largest in the world. It will link San Fraisco and Oakland and the mainland. The bridge will be four and one-half miles long, double deck, with six fast lanes on one deck and three slow lanes on the other.

In announcing the loan last Saturday, the R. F. C. said that of the $62,000,000 it is estimated that 85 per cent will be paid to labor in San Francisco and in various parts of the country from which will come supplies and equipment. This is in keeping with a provision understood to be in all R. F. C. contracts that only American labor and materials, when available, shall be used.

Practically all structural material and wire will be fabricated in Eastern and Central States, the California Toll Bridge Authority said. Steel members will be shipped by rail.

Bids to Be Called for Soon

Engineers estimate that foundations for the bridge will cost $15,240,000 and bids will be advertised for this work immediately after the State Legislature acts with regard to the contingencies specified by the R. F. C. Within 30 days after legislative action, three phases will be ready: The San Francisco anchorage, $1,110,000; the Yerba Buena (Goat Island crossing), $2,100,000, and the dredging mole construction, $450,000. The West Bay superstructure, at a cost of $16,600,000, can be advertised within 60 days and the East Bay superstructure, at a cost of $8,900,000, within 90 days.

The loan for the San Francisco Bay project followed the R. F. C. announcement earlier in the week when it granted its second self-liquidating loan, made to Prescott, Ariz., that other such loans would be announced as quickly as legal and engineering snags have been removed. It has now become clear that these snags are being removed and that the R. F. C. will act with much greater acceleration in the future than it has been moving.

The Interstate Commerce Commission last Friday approved an R. F. C. "work" loan of $700,000 to the New York, New Haven & Hartford Railroad for repair work in its own shops of 93 locomotives and 160 freight cars.

Considering New York Tunnel

Officials of the Port of Authority of New York held another conference last week with the R. F. C. regarding a $90,000,000 loan for the purpose of proceeding with vehicular tunnel under the Hudson River from West Thirty-eighth Street to Weehawken, N. J. It would require about 25,000 tons of structural material. The discussion is said to have related to the rate of interest. The R. F. C. so far has required 5 per cent on bonds.

The Chicago & Eastern Illinois Railroad applied to the Interstate Commerce Commission for an R. F. C. loan of $338,000, of which $100,000 would be used to replace worn-out steel rails.

The loan to Prescott, Ariz., totaling $50,000, is for the completion of two dams and increasing the reservoir capacity of the water works system. It would require 70 tons of reinforcing steel bars, as well as steel and tie wires, bolts and pipe and fittings. Included in requirements for improvements and additions to the water supply system of Ogden, Utah, for which a loan of $645,620 was granted, is 8200 tons of cast iron pipe in the following lots and sizes: Approximately 23,000 ft. of 36-in.; 36,000 ft. of 26-in.; 34,800 ft. of 6-in. and 4810 ft. of 42-in.

Pipe and other materials in good-sized quantities will be required in connection with work to be undertaken by the use of a loan of $5,784,000 on the Rio Grande flood control job. Construction will extend 150 miles along the Rio Grande River near Albuquerque, N. M. Almost $3,000,000 has already been spent on the project.

Pennsylvania Intrastate Rates on Steel May Be Increased

WASHINGTON, Oct. 10.—Intrastate class rates in Pennsylvania will be raised to a parity with interstate rates between Pennsylvania and adjoining States if a proposed report by Examiner Howard Hosmer of the Interstate Commerce Commission is approved. Protests against the Pennsylvania rates were made by railroads and numerous interstate shippers, including iron and steel interests. The Pennsylvania rates were required to be maintained by long-and-short-haul provisions of the constitution and statutes of that State.

The proceeding is unique in that it presents the first instance in which the Interstate Commerce Commission has been asked to invalidate the intrastate long-and-short-haul provision and also the first in which the State regulation brought in issue is a constitutional provision. The examiner held that the Pennsylvania provision will cause undue advantage to intrastate shipments as against interstate shipments. He proposed that the intrastate rates should not be lower for corresponding distances than the interstate rates.

It was pointed out that, among others, manufacturers at Youngstown, only a short distance from the Ohio-Pennsylvania line, make numerous shipments to Pennsylvania in competition with manufacturers at Pittsburgh and other points in that State. The Youngstown rates are in all cases made on the basis of short-line distances, whereas the Pennsylvania rates are frequently depressed below that basis by rates to more distant points.

A witness for the Bethlehem Steel Co., having most of its plants in Pennsylvania, but others of importance near Buffalo and Baltimore, stressed the inconvenience and unfairness of the rigid long-and-short-haul provision from the standpoint of the iron and steel industry. It was declared that the provision renders distance scales impossible of application on intrastate traffic and inevitably prejudices interstate shippers. Numerous examples were cited.

Steel articles moving in less-carload quantities at 40 per cent of first class are manufactured at both Camden, N. J., and Harrisburg, Pa., it was stated. From Harrisburg to Phoenixville, Pa., the normal rate has been reduced from 21c. to 18c. because the Pennsylvania Railroad desires to carry traffic from Harrisburg to Reading over its circuitous routes at the scale in effect over the Reading's short-line route. This makes the Harrisburg-Phoenixville rate the same as the Camden-Phoenixville rate, which, it was stated, under the findings in the Eastern class rate case, should be lower.

OFF THE ASSEMBLY LINE

Chevrolet Buys Steel for New Car; Other Makers About to Order

DETROIT, Oct. 10.

STEEL buying by the automobile industry showed signs of opening up somewhat the past week, although the tonnage placed was not large. The Fisher Body Corpn. purchased sheet steel for the first run on Chevrolet's new bodies at its Cleveland plant, releases calling for delivery this week. Chevrolet's Flint, Mich., plant, where production of 1933 parts is getting under way, likewise bought some steel for prompt shipment. The local forge and spring plants have resumed operations, but the gear and axle plant continues idle. All signs point to an announcement of Chevrolet's 1933 line about Dec. 1. The only car which is definitely scheduled to appear before that date is Buick, with a mid-November showing, and perhaps Plymouth.

Initial steel releases for the new Chrysler-made cars are expected shortly, now that the allotment of fourth quarter contracts has been completed. Oldsmobile is about to buy steel for its first 10,000 jobs and Willys-Overland for 5000. Ford made no steel "buy" in September and is not likely to order much material this month owing to relatively heavy inventories. Some of the small independent manufacturers have been virtually out of the market for steel for some time and their purchases in the next 60 days will be insignificant in volume.

General Motors is planning on turning out 80,000 cars during fourth quarter, of which Chevrolet will make 50,000 and Buick 10,000.

* * *

Chevrolet and Fisher Body have bought steel for first production run of new Chevrolet car.

* * *

October motor car output now estimated at 65,000 units.

Automobile Makers Cautious

In fact, if the steel industry is hoping for a real gain in its operating rate the remainder of this year, it must look to other consuming channels than the automobile industry. Aside from Buick, Chevrolet and perhaps one or two other makers, motor car companies are in no hurry to put their new wares before a public with deflated purses. Retail sales have recently ceased to follow unseasonal trends and have definitely turned downward, consequently some manufacturers are crossing off the fourth quarter as a non-productive selling period and are biding their time until near the January shows. Then, there is a certain amount of hesitation to go forward too rapidly until the effect on business of the Presidential election is more clearly discerned. Even those makers who have gone so far as to commit themselves to a comparatively early display of 1933 cars are adhering to a cautious production policy and are refusing to risk the building up of new stocks beyond dealers' barest requirements.

General Motors was planning recently to assemble about 100,000 cars in the fourth quarter, but this has been scaled down to 80,000 to 85,000 cars. Chevrolet will turn out 50,000 to 60,000 and Buick 10,000, with the remainder divided among Pontiac, Oldsmobile and Cadillac. Most companies are preparing a program which calls for as steady employment of their men as possible during the winter, hoping to provide work during the most severe weather.

Chrysler Plans Being Completed

Chrysler's plans are rounding into shape rapidly. Although it is true that much effort is being put into the revamping of the Dodge car so as to make it as smart in appearance as Plymouth and De Soto, the Plymouth will continue to be the sales leader for the Chrysler Corpn. just as Chevrolet is for General Motors. Incidentally, it is understood that none of the Chrysler divisions will have a four in its line the coming year. No information is yet available about the new car to be built by Continental Motors other than that it will be a small car and will sell in the lowest price range. Some reports put the price under $400. However, actual manufacture of the car will not get under way for perhaps 60 days or longer. Willys-Overland's bid for volume business will be made with a small car claimed to be unusually smart in appearance. It is to be the most revolutionary ever developed by the Toledo company and low in price.

Detroit Notes

De Soto shipped 1336 cars in September, compared with 1053 in August and 1183 in September of last year. . . . The H. H. Franklin Mfg. Co. is reported entering the medium-price field with a new air-cooled car bearing a new name. . . . Cadillac had a surprising increase in the sale of its highest-price cars during the past month. . . . R. E. Olds bid $100,000 for the defunct Durant plant in Lansing, declaring he has plans for a new industry, but action was postponed until new bids can be taken next month. The plant originally cost $2,000,000. . . . Rockne has shipped more than 21,000 cars since it started production the first of the year. . . . October automobile output will not be over 65,000 to 70,000 cars, showing a decline from September. . . . Ford is still maintaining production on the basis of 1500 to 2000 cars a day, three days a week. . . . Zenith Carburetor Co. is reported to have the contract for the carburetors for the new Continental job. . . . A prominent production official in the motor car industry is authority for the statement that wood wheels are permanently passing out of the picture in favor of wire wheels and steel spoke wheels, both of which are more durable and can be manufactured at a lower cost than wood wheels. . . . Ford has scrapped 72,623 old cars since inaugurating its dismantling process at the Rouge plant in 1930.

Action Against Foreign Steel May Yet Be Taken at Washington

Technicality Caused Reversal of Anti-Dumping Bond Order—Appraisers Failed to Publish Notices

WASHINGTON, Oct. 10.—Failure of appraisers to publish dumping notices now is assigned as the reason for the sudden revocation last week by the Bureau of Customs of its instructions requiring the taking of anti-dumping bonds in connection with importations of steel products. It has been indicated, however, that importers of steel may still be required to put up bonds if they are to continue importing steel where dumping is suspected.

Attention has been called to Section 623 of the Hawley-Smoot tariff act. This section provides that "in any case in which bond or other security is not specifically required by law, the Secretary of the Treasury may by regulations require, or authorize collectors of customs to require, such bonds or other security as he, or they, may deem necessary for the protection of the revenue and to assure compliance with the customs laws and regulations."

It has become clear that the domestic iron and steel industry will continue to make a vigorous effort for protection against alleged dumping of steel and it is believed that the specified section of the tariff act will be turned to as a remedy. Should this move prove successful it would overcome the advantage gained by protesting importers who called attention to the fact that dumping notices had not been published as required by law.

Investigation May Yet Show Dumping of Foreign Steel

Confidence has been expressed that the investigation of the Bureau of Customs now under way will support the complaint of the American Iron and Steel Institute that foreign steel is being sold in the United States at less than the market prices in the countries of origin, including producing nations of Continental Europe.

An open hearing set for Thursday before the Bureau of Customs regarding its instructions to collectors to take anti-dumping bonds of importers of rubber-soled footwear will have an important bearing on the steel case. These instructions were sent out simultaneously with those requiring anti-dumping bonds of steel importers. For some reason, appraisers did not publish dumping notices regarding steel but did so in the case of rubber-soled footwear. Like importers of steel, importers of rubber-soled footwear made strong protests to the Treasury Department, but the Bureau of Customs refused to withdraw its order calling for anti-dumping bonds of importers of rubber-soled footwear. Importers then sought and were granted a hearing and domestic makers of footwear asked also to be heard and that the hearing be open to the public. This request likewise was granted. The upshot will be a general airing of the whole situation.

Anti-Dumping Act May Be Strengthened by Congress

Tied in with the proceeding is the plan of members of the Senate Committee on Finance to institute early hearings on the anti-dumping act, a law separate from the Hawley-Smoot law. The purpose is to tighten the law. At present, it is declared to be difficult to prove a requirement of the anti-dumping act that before dumping duties can be assessed proof of injury to the domestic industry must be established. Republican members of the committee are determined to attempt legislation at the next session of Congress to strengthen the act. It is reported that one plan is to reintroduce legislation such as that proposed at the last session of Congress by Representative Hawley which was designed to offset the effect of depreciated currencies of numerous foreign countries. Because of the low rate of exchange of these currencies it is contended that foreign goods are able to enter the American markets at prices which are far below the American cost of production.

This has developed to proportions which are declared to be increasingly menacing to American industry and labor and to further depress conditions at a time when strenuous efforts are being made to develop a revival of markets and employment.

Japanese Offering Pig Iron and Products of Steel

Imports from countries with depreciated currencies are widespread throughout the world. Of late especial concern is being shown over the growing range of imported Japanese products at prices which are said to be so amazingly low that they could not be even approached by domestic industries. Rubber goods, rugs, carpets, and a long list of other products are said to have been coming in in growing volume from Japan. Now new lines, including iron and steel, are entering the United States from Japan. It is reported that such highly finished material as steel furniture has just been received at San Francisco from Japan, which hitherto was never looked upon as an important factor in the steel markets. Japan, generally an importer of pig iron, now is said to be seeking American markets for that blast furnace product. "Trial" orders of Japanese iron ore are understood to have been placed by American melters, though the tonnage involved so far evidently is small.

The return of Senator Reed of Pennsylvania from abroad is expected to be followed by an early announcement of hearings before the Senate Finance Committee, of which he is a member. Representatives of all American industries, it is said, will be given an opportunity to present evidence of injury suffered by reason of importations. The Pennsylvania Senator is understood to have gained first-hand knowledge while abroad of foreign costs, labor conditions, etc., and will make use of his information in the preparation of legislation to tighten the anti-dumping act and to offset the ill-effect on American industry of depreciated foreign currencies. The Hawley bill which sought to solve the difficulty was defeated in the House Committee on Ways and Means. There was some complaint that administration representatives either were lukewarm or openly opposed to the legislation. The belief exists now, however, that in view of the growing harmful effect on American industry and employment of importations from countries of depreciated currencies the legislation will have administration support.

Thomson-Gibb to Make Wire Machinery

The Thomson-Gibb Electric Welding Co., with plants at Lynn, Mass., and Bay City, Mich., has established a new department for the manufacture of a complete line of wire mill and stranding machinery. The new products will include wire drawing machinery, pointers, take-up frames, planetary, rigid type and high-speed stranders for wire rope, and electric cables; cable armoring and saturating equipment; steel, paper and rubberized taping machines and heads, and electric brazing machines.

A. R. Petterson, formerly with the American Steel & Wire Co., and also formerly chief engineer for the New England Wire Machinery Co., will have charge of the sales and engineering work.

Allis-Chalmers Mfg. Co., Milwaukee, has received an order from the New York City Board of Transportation for $500,000 worth of electrical control equipment for the Eighth Avenue subway.

...PERSONALS...

CHARLES H. LONGFIELD, who has been vice-president and sales manager of the Lamson & Sessions Co., Cleveland, has been appointed general sales manager of the Youngstown Sheet & Tube Co., Youngstown, and assumed his new duties on Oct. 10. Mr. Longfield has been identified with the bolt and nut industry in Cleveland for over 19 years. His first connection with the industry was as a salesman for the Kirk-Latty Co., of which he later became sales manager. When that company was merged with the Lamson & Sessions Co. in 1926 he became sales manager of that company and later was elected a vice-president.

❖ ❖ ❖

J. B. WHITENACK has been appointed exclusive railroad representative in the Chicago district by the Bryant Machinery & Engineering Co., Chicago. For a number of years Mr. Whitenack was on the railroad sales staff, Joseph T. Ryerson & Son, Inc. He will handle for the Bryant company various lines of machine tools and welding equipment. His headquarters will be at the company's offices, 400 West Madison Street.

❖ ❖ ❖

BURNETT J. ABBOTT, superintendent of the gray iron foundry of the Chevrolet Motor Co. at Saginaw, Mich., has been nominated by the Democratic party as its candidate for Secretary of State of Michigan.

❖ ❖ ❖

WILLIAM F. WISE, vice-president and sales manager, Ex-Cell-O Aircraft & Tool Corpn., Detroit, addressed the Detroit chapter of the Society of Automotive Engineers on Oct. 10 on the subject of "Precision Boring."

❖ ❖ ❖

WILLIAM R. WILSON, chairman of the board, Copeland Products, Inc., Mount Clemens, Mich., electric refrigerator manufacturer, has been asked by the management to assume the presidency of the company, succeeding LOUIS RUTHENBURG, who recently resigned. Mr. Wilson for the past few years has been vice-president and general manager of the Reo Motor Car Co.

❖ ❖ ❖

GEORGE B. INGERSOLL, assistant general manager, Fairbanks, Morse & Co., Beloit, Wis., retired Oct. 1 under the company's retirement policy at the age of 65. Mr. Ingersoll, a graduate of Beloit College, class of 1889, joined the company on April 29, 1901, as a clerk in the engine department. Several years later he was made secretary of the corporation and in 1917 he was appointed assistant general manager.

C. H. LONGFIELD

J. J. GILMORE has retired as sales manager of the American Steel & Wire Co. at Birmingham and will be succeeded in that office by FRANK MARMION. Mr. Gilmore had been connected with the sales department of the company for 40 years.

❖ ❖ ❖

J. I. BANASH, Chicago consulting engineer, has been elected president of the National Safety Council. C. T. HULLMUTH, W. H. CAMERON and WILL COOPER, all of Chicago, have been named vice-presidents.

❖ ❖ ❖

T. H. GERKEN, Pittsburgh editor, THE IRON AGE, addressed the monthly meeting of the Pittsburgh Retail Hardware Association Sept. 23 on autumn business prospects in the iron and steel industry.

❖ ❖ ❖

C. O. CROMWELL has been appointed sales representative in the Detroit area, with offices at 607 Stephenson Building, Detroit, for the Cleveland City Forge Co., Cleveland.

❖ ❖ ❖

JULIUS P. HEIL, president, Heil Co., Milwaukee, manufacturer of steel motor truck body equipment, tanks, etc., has been elected president, Elks' 1933 Convention Corpn., organized to conduct arrangements for the coming year's meeting of the B. P. O. E. in Milwaukee. Mr. Heil is chairman, board of directors, Milwaukee Lodge No. 46.

❖ ❖ ❖

HARRY C. O'BRIEN has been named manager of sales of the Pittsburgh district sales office of the American Sheet & Tin Plate Co., effective Oct. 1, succeeding the late Joseph R. Bates. Mr. O'Brien, who has been assistant manager of sales since last February, has been identified with the company for 28 years, and has been in the sales department since 1907.

❖ ❖ ❖

WAYNE T. COX, formerly identified with the sales department of the Faitoute Iron & Steel Co., has joined the New Jersey sales staff of David H. Smith & Sons, Inc., Brooklyn, N. Y.

▲▲ OBITUARY ▲▲

FREDERICK G. PLATT, for 30 years president of the New Britain Machine Co., New Britain, Conn., died in that city after a long illness on Oct. 9, aged 84 years. He was one of the industrial leaders of New Britain for a generation and was active in philanthropic work. He was born in Middlebury, Conn., and settled in New Britain in 1871. Early in his career he was identified with the lumber industry in New England, but later joined the Case Engine Co., which he reorganized as the New Britain Machine Co. Mr. Platt was a director in a number of financial institutions and industrial companies including the Stanley Works of Landers, Frary & Clark and of the Stanley Rule & Level Co.

❖ ❖ ❖

A. POLHEMUS COBB, vice-president of the New Jersey Zinc Co. and a pioneer in the development of the American zinc industry, died after a long illness at his home in Tarrytown, N. Y., on Oct. 6, aged 68 years. He had been identified with the New Jersey company since 1882, when he entered the service of the company as a clerk. Twelve years later he was made secretary and in 1912 became vice-president. He also was president and director of the Palmerton Co., vice-president and director of the Mineral Point Zinc Co., and of the Empire Zinc Co. Mr. Cobb was active in the affairs of the American Zinc Institute and served as its president in 1925.

❖ ❖ ❖

SAMUEL LEWIS SMITH, vice-president, National Malleable & Steel Castings Co., Cleveland, died on Oct. 6 after a short illness. He was 65 years of age. He was born in Cleveland and attended Philips Andover Academy and Yale University. In 1889 he became associated with the National Malleable company, of which his father, Stiles Curtis Smith, was one of the founders. He was a director of the Eberhard Mfg. Co., Cleveland, a member of the executive committee of the Railroad Businessmen's Association, a director of the National Industrial Conference Board and of the Union Trust Co., Cleveland. In addition he held membership in various clubs in Cleveland, New York and Chicago. He was also active in many civic enterprises in Cleveland.

... LETTERS TO THE EDITOR ...

Ethical Buying Would Mean Profitable Selling

Editor, The Iron Age:

So far as offering a solution of the present economic disorder is concerned, it would seem to me that solutions galore have been printed that would have disposed of the problem and remedied the difficulty had many of them been put into practice, but like a serious disease that baffles every effort of a physician for a given period it seems almost as though the present malady must run its course before healing remedies will take effect.

I am allowing myself to express some thoughts on this proposition which seem plausible to me. I have tried to think where there might be a fallacy in them but haven't seen it. I think they're logical, but I still very much doubt the possibility of their being put into practice, because I believe our real difficulty is innate greed and selfishness, and it almost seems as though it were the Almighty's job to readjust that defect in human nature.

Here are the proposals. The established policy of large industries today is to hammer down the price of commodities from their sources of supply, regardless of the cost of producing those commodities by the manufacturer. In desperation and despair the small manufacturer, in too many instances untrained in managerial ability or the wise and safe conduct of business, yields to this pressure and quotes prices which often bring him, and many times his competitors, to ruin. The slogan of a couple of years ago, sponsored by President Hoover and supported by managers of large industry, was "don't reduce wages." This carried for a time, but finally broke under pressure of competition until wage cuts are practically universal in all industry today, and in numerous instances cuts have been many times repeated.

In the automotive industry, production of cars in the higher-priced brackets is practically nil. The cause, —no market. What activity there is in this our largest single industry is in the low-priced car field. Ford leads today in production in that field. Hudson has launched its new Essex. Chrysler and General Motors are on the way with new models that will be out in the late fall all desperately vieing with each other for the market. Are any of these cars now being manufactured showing a profit today? That's confidential information, I appreciate, but I doubt very much if current figures in any one of the automobile plants are black. Lack of volume and the endeavor to give *too much* for the money is the reason.

How can their volume of sales be increased? What is the market for this type of car? Certainly not the wealthy, nor even the well-to-do,—it's the great mass of the working people who want and many times need a car, but have little cash to spare for it. Destructive competition has driven the price of manufactured goods down, reduced output, thrown millions out of employment altogether, and reduced the income of those still employed to a state of bare existence. Thus the potential low-priced car market, which is the working man en masse, is seriously curtailed.

Low-priced cars cannot be produced at a profit except in large volume. Volume production is impossible without a big market. The big market is absent because too many workers are idle or in such extremity. Buying a car is out of the question. Workers are reduced to this state because the industries in which they are employed cannot pay a living wage today. The reason they cannot pay a living wage, or even get back costs on their output, is the pressure for constantly lower prices on the part of the buyer. Thus the vicious circle is complete.

Comfort, happiness, prosperity, will not return till this vicious circle is broken. Can it be broken? Profitless business cannot be continuing business. The returns from a business must cover cost of raw material, cost of a reasonable wage, expense of intelligent overhead and *some profit*, if that business is to continue.

Suppose the leaders of the automotive industry of today, instead of constantly squeezing the life-blood out of their sources of supply, should, through intelligent cooperation, seek to find out the actual cost of production of their sources of supply, going even to the point of checking for efficient management, *requiring* them to pay their employees a reasonable wage and on top of that show a reasonable profit—and then, having found such stable and dependable sources of supply, agree to purchase their product. Suppose they should go further and agree *not* to purchase from a source that offered its product at a ruinously competitive price made possible by squeezing their employees below a living wage return. Would not this program put a premium on efficient management and ethical competition, would it not bring about the return of good wages, would it not fill up the smaller shops now idle, and would it not create a market for the automobile that would allow volume production and thus yield a profit?

A. N. Goddard
President and general manager, Goddard & Goddard Co., Inc., Detroit

Steel Houses and Resistance to Wind

Editor, The Iron Age:

In regard to the discussions of the Small House Forum which was held in New York last May, the writer would like to point out one danger which seems to have been overlooked. It seems that economy in first cost has been given more consideration than permanence and safety.

As an engineer and builder of both wood and steel structures, I find the prime essential in any structure is a substantial frame, for there are three different kinds of loads imposed on every building regardless of size or type. First, the dead load, which includes the weight of the building furniture, etc.; second, the live load, which includes all moving bodies, and, third, the wind load. In many parts of the country the wind load is frequently in excess of all other loads combined and is applied at the point of least resistance; for this reason it is absolutely necessary that the frame be of ample weight and strength to resist this horizontal load. It is possible to build a very light steel house and anchor it to a heavy concrete foundation, but unless the frame or other materials have ample strength to resist the gales common in the vicinity where built, it is obvious that such a structure will prove a liability rather than an asset to the home owner. I believe it will do the steel industry an injury to advocate or exploit the exceptional light-weight house on the claim of economy of first cost at the expense of safety.

By the proper design of columns and main beams and a semi-suspension bridge arrangement of other members the steel frame cannot only be made self-supporting, but will have ample strength to withstand all other reasonable loads. At the same time the tonnage of steel need not be excessive.

We are having to repair a number of buildings in north Georgia this year that were practically wrecked by wind. The frame work in every instance has given way to horizontal pressure, and I imagine a person would have a time trying to sell a light steel home in this section, and especially since the destructive windstorms and tornado which passed through this section the latter part of March.

Let us bear in mind that while the steel house is well out of its swaddling clothes, it is not yet ready for graduation. Nevertheless it offers wonderful opportunities for the steel producer to increase the sale of his products.

Samuel H. Kennedy
Engineer, Samuel H. Kennedy Co., Tunnel Hill, Ga.

• • EDITORIAL COMMENT • •

Areas of Supremacy

WITH the exception of strictly standardized competitive products, every material or machine has a "supremacy area" in which it is superior to all others.

When this area is definitely known and can be definitely shown, sales resistance is reduced to a minimum.

We are going to hear more about these areas in the future than we have in the past, both from sellers and from buyers, because both buying and selling are and will be under increasing competitive pressure.

There will be an increased effort, on the part of purchasers, to select the best material or machine for the intended purpose. Profits will depend, in large measure, on the intelligence exercised in such selection.

As a corollary, successful sales promotion will be based, in equally large measure, upon knowing and defining the supremacy area of the product in terms of the requirements of the prospect.

• • •

Condemning a Tariff That Has Vanished

THE old tariff issue has been dusted off and injected into the current political campaign. One candidate for high political office has gone so far as to contend that our tariff was a major cause of the depression and stands in the way of economic recovery. Apparently he is unaware of the fact that some forty countries have gone off the gold standard and that the depreciation of their currencies has largely canceled the effect of our import duties. This indirect, but no less real, reduction in our trade barriers has not yet set in motion any noticeable revival of industrial activity in this country. On the contrary, it has proved decidedly hurtful to manufacturers of iron and steel and other commodities.

For months the iron and steel industry has been seeking relief from this international competitive situation. But aside from the issuance of an order by the Bureau of Customs requiring the marking of foreign reinforcing bars with the name of the country of origin, nothing has been done. A recent order of the same bureau on Oct. 1 requiring importers of steel to put up anti-dumping bonds was revoked on Oct. 3. The reason now assigned for this sudden turn-about-face is that customs appraisers failed to publish dumping notices. Yet Section 623 of the Hawley-Smoot tariff act authorizes collectors of customs to require importers to put up bonds, even in cases where bonds are not specifically required by law.

It is difficult to understand why available relief under our existing statutes, inadequate as they are, should not be promptly given. Charges of dumping of steel products have been made principally against nations which are still on the gold standard. These countries have reduced their export prices in line with the depreciation of other nations' currencies and apparently with a determination to make sales at any cost. There is as yet no way under the law of checking imports from countries that are off the gold standard. The Hawley bill, introduced in the last session of Congress, was designed to offset the effect of depreciated currencies, but it failed of passage. Meanwhile the flow of cheap goods from such nations is becoming more menacing.

Certain consumers of iron and steel and other materials have imagined that they derived an advantage from the purchase of cheap foreign products. But now the inflow is no longer confined to materials but includes a growing variety of finished products. Japan, whose currency has depreciated 50 per cent or more, is making a particularly insistent drive to increase its exports to this country. Usually an importer of pig iron, it is now offering the product of its Manchurian blast furnaces in this country. Not stopping with primary materials, it is shipping us rubber goods, rugs, carpets in growing volume. Japanese rubber boots bought in this country at 23c. a pair, duty paid, would cost $1.19 to duplicate in American factories. And what is particularly significant to manufacturing users of iron and steel, Nipponese exports to this country now include finished articles made of steel, a shipment of steel furniture having recently entered the port of San Francisco.

The issue before the country today is not the reduction of our tariff but rather the restoration of needed protection at a time when the disorganization of the world's currencies has exposed us to competition of unparalleled severity.

• • •

Sharp Rise In Steel Production

BESSEMER and open-hearth steel ingots were produced at 37,502 tons per working day in September, against a rate of 30,830 tons in August, an increase of 21.6 per cent. The September rate was computed in the conventional manner, Labor Day not being a "steel mill holiday." Even if some steel was made on the day, the consumers did not bother to work on that day, and thus the increase was in essence greater than the computation shows.

It was a larger increase than had been predicted or than was being estimated during the month. Gains in demand were so widely distributed, and the sum total was still so low, that it did not look as if demand was increasing as much as was the case, and it is to be noted furthermore that with rising operations ingot production must increase before finished steel shipments and vice versa. From August to September finished steel shipments did not increase as much as ingot output, but heavier shipments this month are foreshadowed.

With ingot production at 14.26 per cent of capacity in August and 17.34 per cent in September, a trend line is set up which puts the closing rate of September at well above 17 per cent, perhaps at above the average rate of last May, which was 19.67 per cent. Surely no one seriously expected a loss of such long duration to be equalized in so short a time.

Steel Ingot Production Gained 21.6 Per Cent in September

Industry Operated at an Average of 17.34 Per Cent of Capacity Against 14.26 Per Cent in August

STEEL ingot production in September, as officially computed by the American Iron and Steel Institute, totaled 975,061 gross tons, against 832,402 tons in August. On a daily basis, September having had one less working day, the output was 37,502 tons, against 30,830 tons in August, a gain of 21.6 per cent. The average rate of production in September, according to the institute's figures, was 17.34 per cent, compared with 14.26 per cent in August.

The September gain was the first since last February. Excepting November, 1931, and January and February of this year, every month since April, 1931, had shown a decline from the preceding month.

Both open-hearth and Bessemer ingot output gained in the past month. The open-hearth output was 804,556 gross tons, against a revised figure of 696,206 tons for August, and Bessemer output was 124,970 tons, against a revised total of 97,323 tons in August.

For the nine months of this year the calculated total is 10,167,765 tons, or less than half of the 20,709,680 tons produced in the corresponding period of 1931. If the output of the fourth quarter merely equals that of the final quarter of last year, which it probably will not, the year's total would be 14,650,800 tons. Unless there should be greater improvement during the remainder of the year that can definitely be foreseen, the 1932 total will be somewhere from 13,500,000 to 14,000,000 tons. In the fourth quarter of 1931 the steel industry operated at an average of a little above 27 per cent.

PRODUCTION OF OPEN-HEARTH AND BESSEMER STEEL INGOTS
(Gross Tons)
Reported by Companies Which Made 95.33 Per Cent of 1930 Ingots

1931	Open-Hearth	Bessemer	Calculated Output All Companies Monthly	Calculated Output All Companies Daily	No. of Working Days	Per Cent Operation
January	2,098,175	286,620	2,512,140	93,042	27	43.80
February	2,131,079	296,974	2,547,027	106,126	24	49.96
March	2,565,531	346,157	3,054,339	117,475	26	55.30
April	2,521,043	316,668	2,706,959	106,421	26	50.09
May	2,130,805	301,639	2,551,633	98,140	26	46.20
June	1,782,007	246,365	2,127,762	81,837	26	38.52
Six Months	13,028,640	1,804,403	15,559,860	100,386	155	47.25
July	1,574,379	225,030	1,887,580	72,599	26	34.17
August	1,462,254	174,380	1,716,829	66,032	26	31.08
September	1,274,072	199,151	1,545,411	59,439	26	27.98
October	1,519,958	195,943	1,590,486	58,906	27	27.72
November	1,276,856	240,441	1,591,644	63,666	25	29.97
December	1,668,384	172,046	1,301,211	50,047	26	23.56
Total	21,004,543	3,011,394	25,192,715	81,006	311	38.13

These figures of "per cent of operation" are based on the annual capacity as of Dec. 31, 1930, of 86,069,570 gross tons for Bessemer and open-hearth steel ingots.

Reported for 1932 by Companies Which Made 95.33 Per Cent of 1931 Ingots

1932	Open-Hearth	Bessemer	Calculated Output All Companies Monthly	Calculated Output All Companies Daily	No. of Working Days	Per Cent Operation
January	1,230,661	160,623	1,459,450*	56,133*	26	25.96*
February	1,252,368	157,067	1,457,710*	58,308*	25	26.96*
March	1,149,267	193,944	1,409,054*	52,187*	27	24.13*
April	1,036,227	144,197	1,238,250*	47,625*	26	22.02*
May	950,785	103,593	1,106,030*	42,540*	26	19.67*
June	755,123	100,249	897,275	34,511	26	15.96
July	652,650	102,872	792,533	31,701	25	14.66
August	696,206*	97,323*	832,402	30,830	27	14.26
September	804,556	124,970	975,061	37,502	26	17.34
Nine Months	8,508,083	1,184,848	10,167,765	13,452	234	20.09

*Revised.
The figures of "per cent of operation" are based on the annual capacity as of Dec. 31, 1931, of 67,473,630 gross tons for Bessemer and open-hearth steel ingots.

James A. Farrell to Teach Foreign Trade at College

WASHINGTON, Oct. 10.—James A. Farrell, former president of the United States Steel Corporation, will conduct a seminar in foreign trade at Georgetown University's School for Foreign Service and will take up the work of instruction next month. Mr. Farrell made the initial endowment for the school 13 years ago. It is the first school of the kind in the Western world.

Mr. Farrell is a regent of the university, and was induced last week by Dr. W. Coleman Nevils, S. J., president of the university, to teach foreign trade to students there. He will begin in a modest way, it was stated, and, if he considers results are satisfactory, he will give more attention to instruction next year and spend a great deal of time in Washington, where he will also be in a position to give greater efforts as chairman of the Foreign Trade Committee of the Chamber of Commerce of the United States.

Pittsburgh to Cleveland Coal Rate Reduced

WASHINGTON, Oct. 10.—The Interstate Commerce Commission has permitted the Pittsburgh & West Virginia Railroad to apply reduced rates on coal from the Pittsburgh to the Cleveland district. The carrier cut the rates in order to meet competition with the Wheeling & Lake Erie Railroad, which recently lowered rates on coal from the Ohio No. 8 district to Cleveland. Trunk line carriers are opposing the reduced rates. A hearing will be held before Examiner Weems on Oct. 24. Previously the Pittsburgh & West Virginia rates were suspended, but the commission vacated its suspension order, permitting the rates to become operative pending hearing. Ordinarily, a reverse policy is pursued and rate changes are suspended pending hearing.

Tariff Commission to Consider Hoops, Bands

WASHINGTON, Oct. 10.—The Tariff Commission has ordered an investigation under the flexible provision of the tariff act regarding differences of costs of production of hoops, bands and cotton ties in the United States and abroad. The inquiry is the outgrowth of applications made by the American Iron and Steel Institute for increased duty on a wide range of steel products. The duty on hoops, bands and cotton ties is 25c. per 100 lb.

Oil Storage Tanks Lead Fabricated Plate Awards

WASHINGTON, Oct 10.—Orders for fabricated steel plate totaled 11,844 tons in August as against 12,485 tons in July, according to reports received by the Bureau of the Census from 51 identical manufacturers. The largest distribution in both August and July was for oil storage tanks, August requirements rising to 4394 tons, against 3661 tons. In the first eight months of 1932, orders for fabricated steel plate were 115,506 tons, compared with 213,487 tons in the corresponding period of last year. Oil storage tank tonnages were 28,834 and 80,937 respectively.

Steel Orders and Production Continue to Gain Slowly

Tin Plate and Sheets Making the Best Showing with Some Increases in Bars—Eastern Mill Buys 20,000 Tons of Pig Iron

STEEL business is gaining slowly, but confidence still exists that there will be an extension of the gradual improvement of recent weeks, despite the depressive influences of the Presidential election campaign and declines in security prices.

Ingot production for the entire country is estimated for this week at 19 per cent of capacity, compared with the calculation for September by the American Iron and Steel Institute of 17.34 per cent. Last month's output of raw steel was the largest since May, and the rise in the daily rate, which was 21.6 per cent as compared with August, was the first since February.

The gain of 15,495 tons in the unfilled orders of the United States Steel Corpn. for September, while smaller than was expected in view of large orders for forward delivery that were placed on the Corporation's books last month, nevertheless has some favorable significance in that it is the second small increase following 16 months of decline.

THE major consuming industries that must provide a good deal of the tonnage necessary to place the steel industry upon a substantially better basis of production are moving slowly in plans to bring about a better business and employment situation. Even the Government-sponsored projects have been delayed too long to be much of a factor prior to the election.

The Reconstruction Finance Corporation has granted a loan of $62,000,000 for the San Francisco Bay bridge, which will take 170,000 tons of structural steel and wire cable, 20,000 tons of reinforcing bars and a large quantity of pipe, but it will be several weeks before bids are taken, and additional time must elapse before any of the steel is rolled.

The New York, New Haven & Hartford has been added to the railroads that have received R. F. C. loans for equipment building or repairs. Scarcely any steel tonnage for the programs already provided for has reached the mills, nor is there any indication as yet of any concerted buying movement in rails, such as is usually in evidence at this time of the year. The disinclination of some of the roads to engage in repair work will, it is believed, disappear if recent increases in traffic continue. The Pennsylvania is expected to inquire this week for 15,000 tons of plates and shapes for new cars, and the Reading has ordered a second lot of 600 tons of plates for repair work. The Norfolk & Western will buy 3000 tons of track accessories in addition to 5000 tons of rails. About 9000 tons rolled steel wheels will be bought for New York subway cars.

The automobile industry is proceeding somewhat cautiously on production of new models, but has bought some steel. Chevrolet has ordered sheets for bodies to be fabricated at Cleveland and other steel products for its Flint, Mich., plant. Initial releases of steel for new Chrysler cars are expected soon. Ford's purchases are likely to be minimized by the relatively heavy inventories still carried. October output of automobiles will fall below that of September.

MUCH of the past week's improvement in steel mill schedules has come about through larger tin plate orders. However, there has also been better buying of sheets and bars from miscellaneous sources and usually in small lots, a situation which reflects the fact that betterment in business is more in evidence among the numerous minor channels of consumption than in the major industries.

In some finished steel lines, notably tin plate and sheets, the stepping up of mill schedules is greater than is indicated by the slight advance in the rate of ingot production, as steel producers hesitate to start up furnaces until there are more definite indications that recent gains will continue. This caution, which extends to some consuming lines, is generally attributed to doubt as to the outcome of the Presidential election.

Tin plate mill operations are averaging about 40 per cent, with one mill preparing for a short run at full capacity. Some of the sheet mills are doing as well as 25 to 30 per cent of their finishing capacity, partly as a result of an accumulation of orders prior to Oct. 1, when some price advances went into effect. The mills have insisted that shipments of these lower-priced orders be taken by Oct. 15.

Pig iron business in the Chicago district is approaching the proportions of a concerted buying movement, while shipments there thus far in October are exceeding the September average by 50 per cent. An eastern Pennsylvania steel maker has bought 20,000 tons of basic iron and may place a duplicate amount.

A CABLE to THE IRON AGE reports improving steel business in Germany and Belgium, with some further strengthening of prices. Despite the rescinding of an order requiring the posting of bonds on European steel imports into this country when dumping is suspected, the investigation of the import steel situation is being continued at Washington, and there is still a prospect that a remedy will be applied.

THE IRON AGE composite prices for finished steel, pig iron and steel scrap are unchanged.

▲▲▲ A Comparison of Prices ▲▲▲

Market Prices at Date, and One Week, One Month and One Year Previous
Advances Over Past Week in Heavy Type, Declines in Italics

Pig Iron

	Oct. 10, 1932	Oct. 4, 1932	Sept. 13, 1932	Oct. 13, 1931
Per Gross Ton:				
No. 2 fdy., Philadelphia	$13.84	$13.84	$13.84	$16.26
No. 2, Valley furnace	14.50	14.50	14.50	17.00
No. 2 Southern, Cin'ti	13.82	13.82	13.82	14.68
No. 2, Birmingham	11.00	11.00	11.00	12.00
No. 2 foundry, Chicago*	15.50	15.50	15.50	17.00
Basic, del'd eastern Pa.	14.50	13.50	13.50	16.75
Basic, Valley furnace	13.50	13.50	13.50	15.50
Valley Bessemer, del'd P'gh	16.89	16.89	16.89	18.76
Malleable, Chicago*	15.50	15.50	15.50	17.00
Malleable, Valley	14.50	14.50	14.50	17.00
L. S. charcoal, Chicago	23.17	23.17	23.17	25.04
Ferromanganese, seaboard, carlots	68.00	68.00	68.00	85.00

*The average switching charge for delivery to foundries in the Chicago district is 61c. per ton.

Rails, Billets, etc.

Per Gross Ton:				
Rails, heavy, at mill	$42.00	$42.00	$42.00	$42.00
Light rails at mill	32.00	32.00	32.00	34.00
Rerolling billets, Pittsburgh	26.00	26.00	26.00	29.00
Sheet bars, Pittsburgh	26.00	26.00	26.00	29.00
Slabs, Pittsburgh	26.00	26.00	26.00	29.00
Forging billets, Pittsburgh	33.00	33.00	33.00	35.00
Wire rods, Pittsburgh	37.00	37.00	37.00	35.00
	Cents	Cents	Cents	Cents
Skelp, grvd. steel, P'gh, lb.	1.60	1.60	1.60	1.60

Finished Steel

	Cents	Cents	Cents	Cents
Per Lb. to Large Buyers:				
Bars, Pittsburgh	1.60	1.60	1.60	1.60
Bars, Chicago	1.70	1.70	1.70	1.70
Bars, Cleveland	1.65	1.65	1.65	1.65
Bars, New York	1.95	1.95	1.95	1.93
Tank plates, Pittsburgh	1.60	1.60	1.60	1.60
Tank plates, Chicago	1.70	1.70	1.70	1.70
Tank plates, New York	1.898	1.898	1.898	1.88
Structural shapes, Pittsburgh	1.60	1.60	1.60	1.60
Structural shapes, Chicago	1.70	1.70	1.70	1.70
Structural shapes, New York	1.86775	1.86775	1.86775	1.855
Cold-finished bars, Pittsburgh	1.70	1.70	1.70	2.10
Hot-rolled strips, Pittsburgh	1.45	1.45	1.45	1.55
Cold-rolled strips, Pittsburgh	1.90	1.90	1.90	2.15

Finished Steel

	Oct. 10, 1932	Oct. 4, 1932	Sept. 13, 1932	Oct. 13, 1931
Per Lb. to Large Buyers:	Cents	Cents	Cents	Cents
Hot-rolled annealed sheets, No. 24, Pittsburgh	2.20	2.20	2.10	2.40
Hot-rolled annealed sheets, No. 24, Chicago dist. mill	2.30	2.30	2.20	2.50
Sheets, galv., No. 24, P'gh	2.85	2.85	2.75	2.90
Sheets, galv., No. 24, Chicago dist. mill	2.95	2.95	2.85	3.00
Hot-rolled sheets, No. 10, P'gh	1.55	1.55	1.55	1.70
Hot-rolled sheets, No. 10, Chicago dist. mill	1.65	1.65	1.65	1.80
Wire nails, Pittsburgh	1.95	1.95	1.95	1.90
Wire nails, Chicago dist. mill	2.00	2.00	2.00	1.95
Plain wire, Pittsburgh	2.20	2.20	2.20	2.20
Plain wire, Chicago dist. mill	2.25	2.25	2.25	2.25
Barbed wire, galv., Pittsburgh	2.60	2.60	2.60	2.55
Barbed wire, galv., Chicago dist. mill	2.65	2.65	2.65	2.60
Tin plate, 100 lb. box, P'gh	$4.75	$4.75	$4.75	$4.75

Old Material

Per Gross Ton:				
Heavy melting steel, P'gh	$9.75	$9.75	$9.50	$10.25
Heavy melting steel, Phila.	7.25	7.25	7.25	8.25
Heavy melting steel, Ch'go	6.00	6.00	6.25	8.00
Carwheels, Chicago	7.00	7.00	7.00	9.50
Carwheels, Philadelphia	10.00	10.00	9.50	12.00
No. 1 cast, Pittsburgh	10.00	10.00	10.00	10.00
No. 1 cast, Philadelphia	9.50	9.50	9.50	11.50
No. 1 cast, Ch'go (net ton)	6.25	6.25	6.25	8.50
No. 1 RR. wrot., Phila.	7.50	7.50	7.50	10.00
No. 1 RR. wrot., Ch'go (net)	4.50	5.00	5.00	7.00

Coke, Connellsville

Per Net Ton at Oven:				
Furnace coke, prompt	$1.75	$2.00	$2.00	$2.40
Foundry coke, prompt	2.75	2.75	2.75	3.50

Metals

	Cents	Cents	Cents	Cents
Per Lb. to Large Buyers:				
Lake copper, New York	6.25	6.25	6.37½	7.37½
Electrolytic copper, refinery	6.00	6.00	6.00	6.75
Tin (Straits), New York	24.25	24.50	24.50	23.12½
Zinc, East St. Louis	3.05	3.10	3.45	3.45
Zinc, New York	3.42	3.47	3.82	3.80
Lead, St. Louis	3.00	3.10	3.45	3.82½
Lead, New York	3.15	3.25	3.60	4.00
Antimony (Asiatic), N. Y.	5.62½	5.62½	5.75	6.50

On export business there are frequent variations from the above prices. Also, in domestic business, there is at times a range of prices on various products, as shown in our market reports on other pages.

▲ ▲ ▲

▲▲▲ The Iron Age Composite Prices ▲▲▲

Finished Steel

Oct. 10, 1932	1.977c. a Lb.
One week ago	1.977c.
One month ago	1.965c.
One year ago	2.014c.

Based on steel bars, beams, tank plates, wire, rails, black pipe, sheets and hot-rolled strip. These products make 85 per cent of the United States output.

	High	Low
1932	1.977c., Oct. 4	1.926c., Feb. 2
1931	2.037c., Jan. 13	1.945c., Dec. 29
1930	2.273c., Jan. 7	2.018c., Dec. 9
1929	2.317c., April 2	2.273c., Oct. 29
1928	2.286c., Dec. 11	2.217c., July 17
1927	2.402c., Jan. 4	2.212c., Nov. 1

Pig Iron

$13.64 a Gross Ton	
13.64	
13.64	
15.34	

Based on average of basic iron at Valley furnace and foundry irons at Chicago, Philadelphia, Buffalo, Valley and Birmingham.

	High	Low
1932	$14.81, Jan. 5	$13.64, Aug. 16
1931	15.90, Jan. 6	14.79, Dec. 15
1930	18.21, Jan. 7	15.90, Dec. 16
1929	18.71, May 14	18.21, Dec. 17
1928	18.59, Nov. 27	17.04, July 24
1927	19.71, Jan. 4	17.54, Nov. 1

Steel Scrap

$7.67 a Gross Ton	
7.67	
7.67	
8.83	

Based on No. 1 heavy melting steel quotations at Pittsburgh, Philadelphia and Chicago.

	High	Low
1932	$8.50, Jan. 12	$6.42, July 5
1931	11.33, Jan. 6	8.50, Dec. 29
1930	15.00, Feb. 18	11.25, Dec. 9
1929	17.58, Jan. 29	14.08, Dec. 3
1928	16.50, Dec. 31	13.08, July 2
1927	15.25, Jan. 11	13.08, Nov. 22

Pittsburgh Steel Mills Aided by Tin Plate and Sheet Orders

▲▲▲

PITTSBURGH, Oct. 10.—The steel industry's improvement is still a gradual one, with the recovery more marked in tin plate and sheets than in other finished products. Tin plate business, now good enough to provide 40 per cent of capacity engagement of the mills and giving promise of a maintenance of this rate for some time, is taking a higher proportion of raw steel production than recently, but it is a question whether it has caused any direct increase in ingot output.

In the immediate Pittsburgh district, crude steel production in the week ended last Saturday was at the same rate as in the week before, or approximately 16 per cent. The Youngstown district has not appreciably increased over its rate of the week before, but there is a tendency toward gain in the Wheeling area, which includes a Steel Corporation unit, the principal product of which is sheet and tin bars.

The industry still is hopeful about the immediate future, but is not pursuing any wild fancies that the upswing is to be other than gradual. Even those manufacturers who are not direct beneficiaries of railroad business incline to the belief that demand will hardly show real vigor until there is some railroad buying. In the meantime, dependence will be upon such business as results from the help extended through the Reconstruction Finance Corporation and the actual requirements of other consuming interests.

Coke prices are definitely lower, and a lack of consumer buying has a tendency to soften the tone of the scrap market, while there is some doubt that the price of basic pig iron can hold out in the face of recent sales, which admittedly figured out to a lower price than has been quoted. In finished steel, prices are quite steady save in a few spots.

Pig Iron

Trading has lapsed back to its former moderate proportions following the recent purchases of basic grade by a Pittsburgh district sheet maker amounting to between 25,000 and 30,000 tons and of a sizable tonnage of Bessemer iron by a producer of iron pipe. The basic tonnage is understood to have been divided among two steel companies and one merchant producer of iron, all of which are able to ship by water. Except that the

Improvement in steel business in Pittsburgh area is slow.

* * *

Orders for tin plate and sheets show the most definite upward trend.

* * *

Coke prices lower, and scrap market shows signs of weakness.

▼▼▼

price was below the published market, there are no details as to this transaction. The sale of Bessemer iron, which also will move by water to the buyer, is said to have been made at under the published quotations. Except that some of the radiator companies have been seeking fair-sized lots of foundry iron, inquiries have been few and usually for single carloads. Demands upon the roll foundries are small in keeping with the light operation of rolling mills. There are about 1200 tons of steel castings in a local lock and dam job, and it is probable that Pittsburgh district foundries will get the business. While sizable inquiries get special consideration as to prices, there is no occasion to change quotations on the general run of orders.

Semi-Finished Steel

Rising tin mill operations find some reflection in the releases of tin bars and to a somewhat freer movement of wire products is traceable an increase in rod specifications. Billets are slow and the semi-finished steel market as a whole is better only by comparison with the conditions of the late summer. Prices are unchanged.

Tubular Goods

Except in those cases where makers are producing to build up their distributers' stocks, operation of pipe and tube mills still is low, although well up from the extreme low point of the midsummer. Oil country pipe is not doing very well, owing to the disturbance in oil prices in the Southwest, with the attendant repercussion in other producing and marketing areas. The effort to pro-rate output and keep the total production under 2,000,000 barrels daily is threatened with failure because of what are called "bootlegging" activities by some well owners, who are taking out hot oil at night, evading taxes and selling well under regular prices. Merchant pipe benefits from fall heating demands. Tubing demands are up as much as 50 per cent from the summer low point. Prices are regarded as well stabilized following the recent elimination of the extras beyond the quoted discounts.

Wire Products

Manufacturers derive some satisfaction from the fact that in keeping with most other finished steel products, nails and wire have gained in demand, but much more from the fact that, while both consumers and jobbers are buying close to real needs, they are offering less resistance to prices.

Bars, Plates and Shapes

The great bulk of the structural steel business, as has been true for some time, is in public work, which is being assisted by loans by the Reconstruction Finance Corporation. Demands on the mills for plates, shapes and bars are numerous enough, but individually are largely of warehouse proportions. Cases are numerous where buyers who in the past have rarely ordered less than carloads of bars of a size now are asking for 10,000 or 12,000 lb. and then wanting shipment to be made immediately. This is difficult work for the mills and also for the buyers, who frequently find it necessary to do much shopping to find a mill running on the sizes wanted. The story is not much different in plates. Mills derive some satisfaction from these conditions, since they plainly indicate an absence of stocks between the mills and ultimate consumers. Prices appear well sustained at recent levels.

Cold-Finished Steel Bars

While a few of the motor car builders are ordering some steel in connection with the introduction later in the year of new models, the market is better only to the extent of the rally over the past several weeks from the extreme low point of the summer.

Sheets

Further improvement in business is noted and, while some important producers are operating at less, the general average of sheet mill engagement is now placed at 25 per cent of capacity. The gain in business is principally in galvanized sheets, which are having a good sale in the South. Some of the General Motors units are mak-

ing ready to introduce new models before the end of the year, and some sheets are moving to them, although in quantities suggestive of the trying out the new dies rather than in production of complete cars. Sheet prices are much firmer than they were a short time ago.

Tin Plate

Distribution of early 1933 requirements by the leading can company, in which both the leading interest and several independents shared, has not only lifted the operating rate of the mills to a very much higher basis than that of other classes of rolling mills, but gives assurance of the maintenance of a 40 per cent rate for several months. There has been no announcement yet of the price for the first quarter and half of next year, but it is assumed that there has been an understanding about it between buyers and makers.

Strip

There will have to be an increase in automobile production before strip steel can do very well. There has been improvement in business and in mill engagement from the low point of the summer, but it is doubtful if the output is running more than 15 per cent of capacity. Business is at the recent range of prices. On cold-rolled strips, 12 in. or narrower, the market appears to be firmer than it has been.

Coke and Coal

With so few blast furnaces in operation and so few of these without recourse to by-product oven coke, the market for beehive oven furnace coke is extremely limited. Moreover, the competition of the by-product oven coke is sharp and sales of the old method coke at more than $1.75 per net ton at ovens are infrequent. Local demand for beehive oven foundry coke is light, as few of the foundries in this district are doing much, but from outside points the call is better and for larger quantities than was true recently. Industrial and railroad buying of coal is light and, since there is no danger of higher prices in the near future, domestic demands are not as heavy as they would be if there was a price incentive.

Scrap

Expectations that one of the Steel Corporation subsidiaries would be a buyer of heavy melting steel scrap have failed to materialize. Sales of a small lot of rails to a district steel makers are noted at $9.25 and that price also was paid by a dealer on a small tonnage of railroad steel. Scrap in the Pennsylvania Railroad list, including approximately 9000 tons of heavy melting grade, will be awarded Oct. 12. It is believed that around $10 will be paid for the heavy melting steel. In general, the market is simply marking time with no material changes in prices. No. 2 heavy melting steel is down slightly and ordinary sheet bar crops are not salable at more than the heavy melting steel price. Difficulty is experienced in selling the low phosphorus grades at the prices quoted because of the low operation of the steel foundries. In Youngstown, sales of heavy melting steel are noted at $9.50 and of hydraulic compressed sheets at $9.

Coal Selling Agency Held To Be Violation of Anti-Trust Law

Remedy Is With Congress Is Lower Court's Decision, Which Will Be Appealed to Supreme Tribunal

WASHINGTON, Oct. 10.—Considered generally as a test case to determine the rights of industry under the Sherman anti-trust law, Appalachian Coals, Inc., has announced its purpose to appeal to the United States Supreme Court from the recent decision of the special three-judge Federal Circuit Court, which held that the organization is illegal.

Appalachian Coals, Inc., is made up of 137 producers of bituminous coal in the so-called Southern Appalachian field in Virginia, West Virginia, Kentucky and Tennessee and was set up as an exclusive selling agency with the power to fix prices at which coal is sold. The court held that the plan is an agreement to restrain interstate commerce and an attempt to monopolize trade. The producers, it was declared, mine 54 per cent of the coal produced in the Appalachian territory and control not only a substantial part of the production in the field in which they operate, but also a substantial part of the coal sold in the markets in which they compete.

Would Eliminate Competition

In enjoining the agency, as requested by the Department of Justice, the court held that the sale of coal through Appalachian Coals, Inc., would necessarily eliminate competition as to prices between the producers who are member of the organization. It was declared further that, although the selling agent would not be able to fix market prices or establish monopoly control in the markets, the volume which it would handle would be so great that the elimination of competition among the producers and the power to fix uniform prices would necessarily affect the market prices. It was held that the so-called "rule of reason" was not applicable.

Because of an agreement with the Department of Justice to first test its legality in the courts, Appalachian Coals, Inc., has not begun to operate. The court, consisting of Judges Parker, Northcutt and Soper, pointed out that it is but due to the defendants to say that "the evidence in the case clearly shows that they have been acting fairly and openly, in an attempt to relieve the deplorable conditions resulting from over-expansion, destructive competition, wasteful trade practices and the inroads of competing industries."

Remedy with Congress, Not Courts

The court said that it is argued with much force that organization is essential to the preservation of the coal industry and that organization can be effected only by means of some such agreement as that embodied in the coal selling agency. But this, the court declared, is an argument which addresses itself to the law-making branch of the Government and that therefore the remedy is with Congress and not with the courts. The court said it sympathized with the plight of those engaged in the coal industry, whether as operators or miners, but pointed out that it had no option but to declare the law as it finds it.

"We cannot repeal acts of Congress nor can we overrule decisions of the Supreme Court interpreting them," the court declared.

The decision recalls the fact that President Hoover has from time to time recommended that Congress liberalize the anti-trust laws, particularly as they relate to the coal and other raw resource industries.

Dutch Iron Importation Wrongly Assigned

WASHINGTON, Oct. 11.—The Division of Statistics, Department of Commerce, has announced that imports of 4709 gross tons of pig iron in August were erroneously assigned to Sweden and should have been assigned to the Netherlands. There were no pig iron imports from Sweden in August, while those from the Netherlands were 5668 tons instead of 959, as originally given by the division. In the eight months ended August, 1932, pig iron imports from Sweden were only 422 tons, while those from the Netherlands totaled 41,110 tons.

Chicago Pig Iron Business is the Best of the Year

CHICAGO, Oct. 10.—The slow forward movement of finished steel sales and specifications is unhalted, and sellers believe the present trend will continue. The effect of this situation is not pronounced in ingot production for the reason that mills are trying to use the additional tonnage to smooth out the irregularities of rolling schedules. For instance, at one mill the week's business would justify the addition of two open-hearths, but these will not be put on until a more definite knowledge of the trend can be had. However, steel output in this district is well entrenched at 18 per cent of capacity.

The showing in bars is distinctly encouraging, and tank plates are taking a more active part in the market. In some lines, such as wire products and bolts and nuts, new buying and specifications are lighter, but inquiries are in sufficient volume to lead sellers to look upon the present lull as temporary.

The scrap market is marking time. Country yards are again gathering scrap and already have sizable stocks. Users at consuming centers in the Middle West are amply supplied for the time being.

Pig Iron

Releases continue to gain, and new buying of Northern foundry iron has reached such proportions as to be the best of the year. The character of trade is not such that it can be called a concerted buying movement, and yet it is not far from that stage. The October rate of shipments is now about 50 per cent above the September rate and further growth is anticipated by producers. Specifications for alloys are still spotty, but nevertheless heavier in the aggregate.

Sheets

Output, which ranges from 15 to 18 per cent of capacity, is very irregular. Consumer interest still does not reach beyond immediate needs. The number of orders is slowly increasing, and in this particular alone sellers can measure improvement in the market.

Bars

Specifications for bars are growing more rapidly than are releases for other heavy finished steel commodities. There is gradual growth in the size of individual orders, and sellers take courage from the fact that old customers, who have been out of the market for many months, are returning for steel needs. Releases from farm implement manufacturers are

▲ ▲ ▲

Pig iron business in Chicago district best of the year. October shipments running 50 per cent above September rate.

* * *

Scrap market weak, with some price declines.

* * *

Steel buying gains slowly, but sellers are confident upward trend will continue.

▼ ▼ ▼

larger, but this industry is pursuing a conservative program. Several parts makers are in the market preparatory to making accessories for new automobile models.

Structural Material

Both fresh inquiries and new lettings are light, but the tonnage of public work out for figures holds promise to shops that find private work very scarce. The only new inquiry of size is for 1500 tons for a bridge at Kansas City.

Plates

The 500 cars to be purchased by the Chicago Great Western will require about 6000 tons of plates, shapes and bars. Underframes ordered by a refrigerator line call for 500 tons. Miscellaneous business from the railroads is no heavier. Scattered orders for tank plates have added 1600 tons to mill books.

Rails and Track Supplies

A few carloads of spikes and bolts have been ordered for prompt delivery. A few similar inquiries are out, and the Northern Pacific may buy track accessories. Opinion is divided as to the prospects for rails to be bought this fall, many believing that the tonnage will be very light. One Chicago rail mill is still producing on a very light schedule.

Cast Iron Pipe

Interest in this commodity continues to drop. Large projects are lacking and even small inquiries are few in number. Foundry schedules are lower, but most producers have accumulated rather sizable stocks, which are ample for immediate shipment of most standard sizes.

Reinforcing Bars

The price tangle, instead of improving, grows steadily worse. Billet steel reinforcing bars have been sold as low as 1.25c. a lb., St. Louis, and rail steel bars are down almost to 1c. a lb. for delivery to the south and west of Chicago. Shipments of bars for road work are near the high point of the year, and a considerable tonnage is yet to be purchased by contractors.

Bolts, Nuts and Rivets

Specifications are still lagging behind the September average. Some business is now coming from railroad shops, and there is promise that this class of business will grow. Automobile wheel manufacturers are again in the market.

Wire Products

Orders received since the beginning of October are not up to the average of September, but shipments are steady. Producers are inclined to believe that dullness in new buying is only a temporary lull in a market that by the end of the month will mark actual improvement. It is generally believed that farmers will use first receipts from grain to meet pressing debts and then will take care of their needs for immediate improvements. Only small quantities of wire products are moving to industries. However, the number of small orders coming from this source indicates a more active demand.

Scrap

This market is very quiet in almost every phase. Steel mill acceptances of heavy melting steel against old orders are somewhat more liberal, but mills are not interested in additional purchases. Incoming shipments from railroads are still of serious concern to dealers, who continue to move cars direct to local docks for storage. The Rock Island is offering 2000 tons of scrap and several Southern railroads are willing to sell. However, bidding is not active and offered prices are in general lower. The result is that many lists frequently are withdrawn from the market. A speculative tendency in country yards now finds them with the heaviest accumulations of the year. Cast iron car wheels are moving more rapidly against old orders. An order is out for steel wheels, but has not been taken, owing in part to scarcity of this grade.

A new line of manually and electrically operated air circuit breakers has been announced by the General Electric Co. They bear the designation AL-2 and are designed for control and protection of apparatus and feeders in buildings, industrial plants and power stations.

Eastern Pennsylvania Steel Mill Buys 20,000 Tons of Iron

Purchase of Basic, Largest in Some Time, May Be Duplicated—Steel Orders Lagging

PHILADELPHIA, Oct. 10.—The outstanding feature of this market is the purchase by an eastern Pennsylvania mill of 20,000 tons of standard basic pig iron from a domestic furnace. It is understood that a similar tonnage may be placed by the same melter soon. The market for steel-making iron has long been dull, and the transaction just closed has aroused unusual interest.

Steel orders have shown little change the past week and, if anything, have lagged somewhat. Additional orders for car work have been placed, and further bookings in the immediate future for railroad programs are in prospect.

Open-hearth operations have dropped one point to 14 per cent of capacity owing to the closing of two steel works furnaces. With orders accumulating slowly, an upward shift may be expected soon.

Pig Iron

The order by an eastern Pennsylvania mill for 20,000 tons of basic iron for delivery over the remainder of the year is the largest booking for this grade made in this district in about two years. The iron is to be supplied by a domestic furnace. It is reported that a like tonnage will be placed soon by the same melter. The purchase price was not announced. Basic iron is quoted at $13.50, delivered this district. An order for 7000 tons of gray forge iron is about to be placed by a melter for its plant at Reading, Pa. This melter has just placed an order for 400 tons of this grade for its foundry at Danville. Increased activity in small orders for foundry grades has developed in the past week. The stocks of one furnace interest are becoming so depleted in some grades that it will blow in a blast furnace about the middle of next week.

Plates, Shapes and Bars

The Reading Railroad has placed about 600 additional tons of plates for its car repair program with an eastern Pennsylvania mill. It is expected also that this carrier will close soon for fabricated tonnage for the same program. The Pennsylvania Railroad is about to ask bids for steel for 1280 all-steel cars it is to build. The work is said to call for about 9000 tons of plates and 6000 tons of shapes.

Sheets

Generally the market is dull. Some makers, however, report a slight increase in orders.

Imports

Imports at Philadelphia last week consisted of 202 tons of pig iron from British India and one ton of ferrotitanium from Italy.

Scrap

The market is quiet, but prices are unchanged. Following the recent flurry, mills have largely withdrawn from the market and shipments on some tonnage remain suspended.

Cincinnati Pig Iron Trade Small and Spotty

CINCINNATI, Oct. 10.—While new business in pig iron continues spotty and small, improvement in shipments and inquiries contribute a firmer undertone to the district market. Single car orders totaling about 800 tons constituted the fresh business the past week. A test of Northern prices, in a sale of 500 tons a week ago, indicates continued softness as the result of brisk competition for business. Southern furnaces are maintaining $10 base, Birmingham, despite the absence of substantial demand.

Coke

Shipments of foundry coke increased the past week under seasonal influences.

Scrap

Continued mill pressure on prices despite scarcity of material is preventing improvement of the scrap market. Dealers' bids are steady, but nominal.

Industrial Machinery Exports Hold Level

Exports of United States industrial machinery for August were valued at $4,200,000, compared with the same amount for July, according to the Commerce Department's Industrial Machinery Division.

Exports of mining, oil well and pumping machinery totaled $1,200,000, a decrease of 34 per cent from the previous month's total. This was offset, however, by an increase of 37 per cent in foreign sales of metal-working machinery, totaling $1,130,000 for August. The latter figure marked a new upward trend for metal-working machinery shipments which had been below the $1,000,000 mark since May, 1932, it was pointed out. Exports of sewing machines in August reached almost twice the $142,000 mark set in July. Other items in the industrial machinery group remained constant.

The eight months of this year averaged up to the lowest monthly average of any post-war year, the machinery division pointed out. However, it is believed that industrial equipment stocks in many foreign countries are low, and the recently noted improvement in many normally important markets for this class of goods may be followed by a gradual revival in demand for producers' goods.

August exports of farm equipment from the United States registered a gain of 34 per cent over those of July, and were the largest monthly shipments since March, according to the Commerce Department's Agricultural Implements Division. The total value of the August exports was $1,883,944, as compared with the July figure of $881,243.

Exports of tracklaying tractors were particularly encouraging, the total of $327,706 having been the heaviest since February, 1931, and greater than the entire shipments of this class of equipment during the first six months of 1932. Shipments of wheel tractors also increased favorably over the July figures, recording a gain of 65 per cent.

Unfilled Orders Gain for Second Month

Unfilled orders of the United States Steel Corpn., as of Sept. 30, reported on Monday, gained 15,495 tons to 1,985,090 tons. This is the second gain after a continuous decline for 16 months. The August increase was 3293 tons.

Unfilled orders at the end of each month since 1929 follow:

	1932 Tons	1931 Tons	1930 Tons
January	2,648,150	4,132,351	4,468,710
February	2,545,629	3,965,194	4,479,748
March	2,472,413	3,995,330	4,571,653
April	2,326,926	3,897,729	4,354,220
May	2,177,162	3,620,452	4,059,227
June	2,034,768	3,479,323	3,968,064
July	1,966,302	3,407,816	4,022,055
August	1,969,595	3,369,457	3,580,204
September	1,985,090	3,144,833	3,424,338
October	.....	3,119,432	3,481,763
November	.....	2,933,891	3,639,836
December	.....	2,735,353	3,943,596

Cleveland Steel Orders Are Gaining at a Slow Rate

Bars Show the Most Improvement—Orders from Automobile Industry Are Not Increasing Much

CLEVELAND, Oct. 10.—Orders for finished steel increased slightly with some producers during the week, but with others there was no change in volume from the previous week. Bars show the most improvement in recent weeks. Demand for these is widely diversified, but orders are for small lots. Steel business from the automotive industry continues slack and little tonnage has been placed as yet for new models that are to come out shortly. However, the Fisher Body Corpn. has placed a small tonnage of sheets for bodies for the new Chevrolet cars.

The Chesapeake & Ohio Railroad has placed its usual requirement orders for bars, plates and shapes, spikes and track bolts for the fourth quarter, but aside from this there is no activity on the part of the railroads.

Plans are out for the Cleveland post office, requiring approximately 10,000 tons of structural steel. Little other structural work is in prospect.

Ingot output in Cleveland remains unchanged at 23 per cent of capacity.

Prices are firm on all steel products except on sheets and cold-rolled strip. On some grades of sheets the lower prices in the range of quotations which prevailed during the third quarter have not disappeared.

Pig Iron

Sales and inquiry declined the past week during which Cleveland interests sold about 2500 tons in small lots. Little new inquiry is pending. While shipping orders are slightly better this month than in September, little tonnage has been released so far in October by the automotive foundries. Prices are steady at regular quotations.

Iron Ore

Ore receipts at Lake Erie docks in September were 548,697 tons, against 619,342 tons in August. Receipts at these ports until Oct. 1 were 1,793,977 tons, against 12,270,487 tons during the same period last year. Shipments from Lake Erie docks in September were 407,600 tons and for the season to Oct. 1 were 1,887,370 tons, against 9,426,591 tons during the same period last year. Receipts at other than Lake Erie ports, mostly at Gary and South Chicago, increased to 171,777 tons last month, compared with 87,508 tons in August. Dock balance at Lake Erie ports Oct. 1 was 5,241,016 tons, against 5,973,654 tons on the same date last year.

Bolts and Nuts

The slight improvement in orders in September is being maintained this month. Business from railroads shows a little gain. Some of the automobile manufacturers have round-lot inquiries out for the last quarter requirements for new models and this business is expected to be placed this month. Some automobile companies are also sounding out the market for first quarter requirements. Prices are well maintained.

Bars, Plates and Shapes

Bids for the Cleveland post office, requiring approximately 10,000 tons of structural steel, will be taken Nov. 15. Ohio will take bids Oct. 14 for a bridge requiring 190 tons of structural shapes and five small bridges taking 210 tons of reinforcing bars. Recent highway bridge work has stimulated mill business in structural steel. Demand for steel bars shows a moderate increase in small miscellaneous orders. Plates are quiet. The market is firm at regular quotations.

Sheets

The market was quieter the past week following the rush of some buyers to get specifications in before Oct. 1. New demand from the automotive industry is slack, although the Fisher Body Corpn. purchased a small tonnage for starting production on Chevrolet models. While some producers are adhering to 2.20c. for black sheets, others are still going to 2.10c. for desirable orders. There is no change in quoted prices on other grades.

Strip Steel

Small-lot orders for hot-rolled strip from miscellaneous sources show a slight gain, and there is a little better inquiry from stamping plants. Very little business is coming from the automotive industry. The market is firm at 1.45c., Pittsburgh, for good orders and 1.50c. for small lots. Concessions to 1.90c. on cold-rolled strip are fairly common.

Scrap

A Cleveland interest that has taken no scrap for several weeks has released a small tonnage of blast furnace scrap and this has resulted in an advance of $1 a ton on these grades, which have been inactive for some time and very low because of a total absence of demand. With the disappearance of orders from dealers for Valley district delivery, there is no demand for other grades, and prices lack firmness.

Canadian Bridge to Take 4000 Tons of Steel

TORONTO, Oct. 10.—The new Caughnawaga bridge to be constructed in Quebec is the most promising tonnage prospect of the steel industry. It is understood that the project will involve approximately 4000 tons of steel. Awards of steel may be made before the end of the month.

Pig Iron

No large contracts have been closed recently, although there has been a slightly better flow of small spot orders. Foundry melt is holding at 20 to 25 per cent. Pig iron prices are firm and unchanged.

Scrap

In this market current demand is specialized, with only a few grades moving. Dealers are out of the market for most grades of scrap, but are accumulating whenever possible those lines that are in demand. No. 1 machinery cast has a steady call. Local dealers report little or no demand for steel scrap, but Montreal dealers announce renewed buying of heavy melting steel and turnings in small lots for immediate delivery. Dealers report no change in price lists.

Boston Pig Iron Sales Small and Scattered

BOSTON, Oct. 10.—Local pig iron sales were small and scattered the past week. However, foundries are specifying against old contracts a little more freely than a month ago, and the New England melt is about 5 per cent heavier than last month at this time. Dutch iron is offered at $13.35 a ton at Providence, R. I., and eastern Pennsylvania No. 2X at around $16.50 a ton, delivered certain Connecticut points.

The slight improvement in scrap sales, noted the past fortnight, has dried up. Current business is confined to an occasional car of textile cast, No. 1 heavy melting steel, bundled skeleton and breakable cast. Prices are unchanged.

New York Steel Trade Has Not Extended Its September Gains

Plate Releases Have Improved, but Otherwise Business Is Barely Holding Its Own

NEW YORK, Oct. 10.—Demand for finished steel has not shown a continuation of the gains that carried through September. In the lighter lines, particularly sheets, the Jewish holidays may have been a local influence retarding specifications. In some of the other products, notably plates, releases have shown a further increase, but generally speaking business is barely holding its own and has lost some of its buoyancy. Possibly the approach of the Presidential election is a dampening influence. Much of the buying to date, outside of tin plate contracting, has been for repairs and replenishment of stocks. Orders have been numerous but small, and buyers have shown marked conservatism about committing themselves beyond immediate needs.

The attitude of the railroads toward equipment repair programs is still notably cautious, but the steady improvement in carloadings is expected to lift their earnings and cause their buying policies to relax. The local subways are in the market for 9000 rolled steel wheels. The Norfolk & Western, which recently entered the market for 5000 tons of rails, will also buy 3000 tons of track accessories.

Public works is still the dominant factor in the structural field. Bids are to be taken this month on the Federal Archives Building, Washington, requiring 8000 tons. Approximately 1300 tons of plates, shapes and bars will be required for three destroyers to be built in the Boston, New York and Philadelphia Navy yards. Bids on the material—which will be used largely for the hulls of the three vessels—will be opened by the Navy Department Oct. 25. Plans and specifications for an 8-in. gun cruiser are being completed and the Navy Department will probably receive tenders from private shipbuilders about Jan. 1.

Finished steel prices are holding reasonably well. Current sheet prices will, of course, remain untested until after Oct. 15, the final date on which shipments at lower figures will be accepted.

Pig Iron

Demand is very quiet. The paucity of important inquiry apparently reflects a well covered position of many foundries which bought rather freely in September. The present lull in activity, moreover, may be attributed to the fact that, while pig iron stocks may be limited in relation to normal rate of consumption, the recent seasonal pick-up in foundry activity has not yet broadened sufficiently to make appreciable inroads upon inventories. Machine tool foundry units have been particularly lagging in showing gains in melt. New contracts closed during the past week involved a total of 2500 tons, compared with a similar quantity the preceding week and 3000 tons two weeks ago. The restricted character of current business affords little test of furnace price schedules, which remain unchanged. A firming in the price of malleable iron in the Buffalo district is evidenced by strict adherence to a 50c. differential for that grade above the $14 base price for foundry iron.

Reinforcing Bars

Current inquiry is light. Private construction work is virtually at a standstill, while State road construction sustains what little demand exists. Awards in this district during the past week, however, were larger. About 1200 tons of bars for highway construction in New Jersey was placed with Kalman Steel Corpn., and about 475 tons of mesh for similar work in New York State was awarded to American Steel & Wire Co. The mill price for normal lots is unchanged at 1.75c., Pittsburgh, or 2.10c., New York.

Scrap

Trading in this market is rather listless. Prices, however, are fairly well maintained, with the exception of No. 1 heavy melting steel, which is being purchased for water shipment at $4.50, on barge, a drop of 50c. from the previous quotation. A moderate tonnage of stove plate, for which a leading dealer paid $4.50, on barge, is being loaded for shipment to Buffalo.

Belgium and German Steel Situation Showing Improvement

LONDON, ENGLAND, Oct. 10 (*By Cable*).—Autumn revival in pig iron is as yet undeveloped. Home consuming industries remain slack and export sales are hampered by international restrictions. Steel trade is dull. Home tariff uncertainties are hampering English demand for Continental steel. There are unconfirmed reports that the tariff may be increased or replaced by quotas.

Belgian steel works report improved conditions with more sales for quick delivery and sentiment better. German works report substantially increased home inquiry for large lots of steel and a general revival of buying is anticipated. The German Saar works are booking fair export business, but the Rhenishruhr works are still out of the market.

Welsh tin plate business is quiet, but inquiry is well maintained. Mills are sold up to their quotas for the next few months and are not pressing sales. On most orders definite shipping dates have been specified; hence the position of the mills is sound. Current output is around 60 per cent of capacity, and an increase is expected as more mills are starting up.

Soviet Russia has placed orders here for mills and presses for a new steel works at Moscow.

British Prices, f.o.b. United Kingdom Ports

Per Gross Ton

Ferromanganese, export	£9
Billets, open-hearth	£4 17s. 6d. to £5 7s. 6d.
Black sheets, Japanese specifications	£9 12s. 6d.
Tin plate, per base box	16s. to 16s. 3d.
Steel bars, open-hearth	£7 17½s. to £8 7½s.
Beams, open-hrth.	£7 7½s. to £7 17½s.
Channels, open-hearth	£7 12½s. to £8 2½s.
Angles, open-hearth	£7 7½s. to £7 17½s.
Black sheets, No. 24 gage	£8 5s.
Galvanized sheets, No. 24 gage	£10

Continental Prices, f.o.b. Continental Ports

Per Metric Ton, Gold £ at $4.86

Billets, Thomas	£2 1s. to £2 2s.
Wire rods, No. 5 B.W.G.	£4 10s.
Black sheets, No. 31 gage, Japanese	£11 5s.
Steel bars, merchant	£2 8s. to £2 10s.
Beams, Thomas	£2 3s.
Angles, Thomas, 4-in. and larger	£2 8s.
Angles, small	£2 10s.
Hoops and strip steel over 6-in. base	£3 to £3 2s. 6d.
Wire, plain, No. 8	£5 7s. 6d.
Wire nails	£5 10s.
Wire, barbed, 4-pt. No. 10 B.W.G.	£8 15s.

Pipe Lines

Pure Oil Co., 35 East Wacker Drive, Chicago, plans steel pipe line from Gueydah, Tex., to refinery at Smith's Bluff, Tex., about 12 miles.

Consumers Power Co., Jackson, Mich., plans immediate construction of natural gas steel pipe line system to Union, Broomfield and Chippewa Townships, connecting with main 8-in. trunk line from Midland gas fields.

Peoples Light Co., Davenport, Iowa, H. E. Littig, general manager, has applied for permission to install a natural gas steel pipe line system, entire project, with trunk line, to cost over $250,000.

Fabricated Structural Steel

Bookings Light—New Projects in Larger Volume

INCLUDING 3700 tons for bridges and post office buildings, awards totaled only 5800 tons, the smallest tonnage since last May. New projects of 25,900 tons compare with 17,400 tons in the previous week. Outstanding inquiries are 10,000 tons for a post office in Cleveland and 8000 tons for a Federal Archives Building in Washington. Awards follow:

NORTH ATLANTIC STATES

Lee, Mass., 120 tons, marble works, to Bethlehem Fabricators, Inc.

State of New York, 290 tons, highway bridges in Essex and Clinton counties, to Lackawanna Steel Construction Corpn.

State of New York, 185 tons, highway bridge in Hamilton County, to Lackawanna Steel Construction Corpn.

State of Pennsylvania, 130 tons, highway bridge at Emporium, to Fort Pitt Bridge Works Co.

Flushing, N. Y., 425 tons, post office, to George A. Just Co.

Jamaica, N. Y., 750 tons, post office, to George A. Just Co.

Little Falls, N. J., 575 tons, Little Falls Laundry Co. building, to McClintic-Marshall Corpn.

SOUTH AND SOUTHWEST

Lee Hall, Va., 400 tons, highway bridge, to McClintic-Marshall Corpn.

Clay County, Ark., 160 tons, bridge, to Virginia Bridge & Iron Co.

Fort Myers, Fla., 154 tons, post office, to Ingalls Iron Works.

Gainesville, Fla., 218 tons, building for University of Florida, to Ingalls Iron Works.

Houston, Tex., 300 tons, bridge for Southern Pacific Railroad, to Petroleum Iron Works.

Dallas, Tex., 300 tons, garage, to Mosher Steel & Machinery Co.

Beckham County, Okla., 450 tons, bridge, to Hackney Iron & Steel Co.

CENTRAL STATES

Shelby, Ohio, 100 tons, power house, to Burger Iron Co.

State of Ohio, 730 tons, bridge in Butler County, to Mount Vernon Bridge Co.

State of Missouri, 200 tons, highway bridge, Jefferson-Washington counties, to Vincennes Bridge Co.

Chicago, 100 tons, dairy building for World's Fair, to Gage Structural Steel Co.

WESTERN STATES

Laramie, Wyo., 130 tons, highway bridge, to Minneapolis-Moline Power Implement Co.

NEW STRUCTURAL STEEL PROJECTS

NORTH ATLANTIC STATES

Brookline, Mass., 160 tons, hospital unit.

New York, 1000 tons, municipal shed and inspection service building.

Kingston, N. Y., 375 tons, State highway department construction.

Ithaca, N. Y., 500 tons, Herman M. Biggs Memorial Hospital; bids Oct. 20.

Washington, 8000 tons, Federal Archives building.

THE SOUTH

Norfolk, Va., 1200 tons, post office.

Norfolk, Va., 800 tons, bridge, for Virginian & Western Railroad.

CENTRAL STATES

Cleveland, 10,000 tons, post office; bids Nov. 15.

State of Wisconsin, 100 tons, Weyauwega bridge; Wisconsin Bridge & Iron Co., Milwaukee, low bidder.

State of Illinois, 2300 tons, highway bridges, including Cook County, 1511 tons and Randolph County, 265 tons; bids to be opened Oct. 26.

Kansas City, Mo., 1500 tons, Seventh Street bridge.

FABRICATED PLATE

AWARDS

Harding, Mass., 200 tons, tank for State, to McClintic-Marshall Corpn.

Peekskill, N. Y., 140 tons, 200,000-gal. elevated tank for Standard Brands, Inc., to Pittsburgh-Des Moines Steel Co.

Buffalo Pig Iron Trade Is Less Active

BUFFALO, Oct. 10.—Interest in pig iron buying is not quite as keen as it has been over the past month. It is probable that an aggregate of around 2500 tons was sold during the past week, but larger inquiries seem to have disappeared. There are some inquiries out for 100-ton lots in the East. Foundry operation is very low with the exception of the heating plants, which are running better than they have for some time.

Steel

Operation of four open-hearths at the Lackawanna plant of the Bethlehem Steel Co. is being continued. The Republic plant is inactive this week. Wickwire Spencer is operating one open-hearth.

Scrap

The market continues firm for No. 1 machinery cast and stove plate, with considerable competition among dealers to obtain these grades, which are scarce.

St. Louis Pig Iron Sales Light; Shipments Larger

ST. LOUIS, Oct. 10.—Shipping instructions for pig iron against contracts for the first week of October show an increase over the same period last month. However, spot business continues light, the local maker's sales for the week being about 500 tons in carload lots. The melt is largely by stove plants, which are seasonally active. Basic and malleable consumption is light.

Steel

Virtually all of the demand for steel for structural purposes is the result of public work. The State of Illinois will open bids Oct. 26 for highway projects requiring 2300 tons of structural steel and 1500 tons of reinforcing bars. Warehouse business the latter part of September showed a marked increase, bringing the total for the month ahead of August, but the improvement was not maintained the first week in October.

Scrap

The principal sale of the week was of No. 1 busheling, resulting in an advance of 50c. a ton in that item. Railroad malleable, a slow-moving item, is 75c. a ton lower, while No. 1 railroad cast is up 50c. The St. Louis-San Francisco has issued its first list since last March, 600 tons, and the Missouri-Kansas-Texas its first of 1932, 800 tons. Other lists: Southern Pacific, 3850 tons, and New York, Chicago & St. Louis, 19 carloads.

Reinforcing Steel

Awards 1100 Tons—New Projects 1950 Tons

AWARDS

State of New York, 300 tons, mesh, highway construction in Rensselaer County, to American Steel & Wire Co.

State of New York, 175 tons, mesh, highway construction, Schoharie to Middleburg, to American Steel & Wire Co.

State of New York, 163 tons, highway construction, Maywood to Babylon, to National Bridge Works.

State of Indiana, 100 tons, highway bridges, to Laclede Steel Co.

Sheboygan, Wis., 300 tons, substructure for municipal water tank, to Truscon Steel Co.

NEW REINFORCING BAR PROJECTS

State of Illinois, 1500 tons, roadwork; bids to be opened Oct. 26. There is also a large tonnage, probably in excess of 2000 tons, to come up for bids on highway bridge work.

Beaumont, Tex., 225 tons, post office; bids opened Oct. 10.

Omaha, Neb., 225 tons, post office.

Cast Iron Pipe

Scarsdale, N. Y., has awarded 328 tons of 12-in. to Central Foundry Co.

White Plains, N. Y., has purchased 260 tons of 12-in. and larger from Donaldson Iron Works.

Yonkers, N. Y., awarded 200 tons of 6-in. to Donaldson Iron Works.

Hudson River Valley State Hospital, Poughkeepsie, N. Y., has awarded 200 tons of 3- to 16-in. to Warren Foundry & Pipe Corpn.

Pomona, Cal., has awarded 160 tons of 6-in. to American Cast Iron Pipe Co.

Stainless steel will be used to make the plaques for the American Institute of Steel Construction to decorate three bridges judged to be the most beautiful erected in the United States and Canada during the past year. As these bridges are built of steel and represent the highest type of bridge æsthetics, it was deemed most appropriate to have the awarding plaques made of stainless steel. The plaques have been donated by the General Alloys Co., Boston.

Non-Ferrous Metals in Poor Demand With Lead and Zinc Prices Lower

NEW YORK, Oct. 10.—Both the domestic and foreign copper markets are nearly stagnant. There is a decided absence of buying by domestic consumers. Despite this, the price holds firmly at 6.25c. a lb., delivered Connecticut, from both primary producers and custom smelters. Very little metal is available from brokers at concessions. Consumers are reported as fairly well covered through February. In the foreign market, sales are reported at 5.70c. to 5.85c. a lb., c.i.f. usual European ports, but demand is light. Lake copper is unchanged at 6.25c., delivered New York.

Tin

In the face of very little demand, prices have fallen only slightly, the quotation today for spot Straits tin, New York, having been 23.95c. a lb., as compared with 24.50c. on Oct. 4. With the exception of a little spot buying each day, consumers have been and are indifferent. As compared with prices on Oct. 4, the London market has declined, spot standard being quoted today at £148, future standard at £149 7s. 6d., and spot straits at £153 15s. a ton. The Singapore price today was £154 5s., contrasting with £155 5s. on Oct. 4.

Lead

Owing partly to lack of demand, the leading interest in the East reduced its quotation on Oct. 7 from 3.25c. to 3.15c. a lb., New York, where it now stands. The corresponding quotation at St. Louis is now 3c. Buying, which was quite active two weeks ago, has diminished decidedly. Consumers are estimated to have covered all their October needs and probably one-third of those for November. Within the last three weeks there have been numerous change in quotations at New York. The market has experienced reductions from 3.60c. down to 3c., up again to 3.25c. and now down again to 3.15c. Because sales in September probably totaled over 28,000 tons, statistics when issued are expected to reveal a reduction in surplus stocks.

Zinc

The same lack of buying interest prevails in this market as in the others, and prices have declined further. Prime Western metal is obtainable at 3.05c. a lb., East St. Louis, or 3.42c., New York. The only constructive feature is the report for September, which showed a decline in smelters' stocks of 8100 tons, largely because of shipments, which at 21,150 tons were 3000 tons larger than in August and 8200 tons in excess of the low in July.

▲ ▲ ▲

The Week's Prices, Cents Per Pound for Early Delivery

	Oct. 3	Oct. 4	Oct. 7	Oct. 8	Oct. 10
Lake copper, New York	6.25	6.25	6.25	6.25	6.25
Electrolytic copper, N. Y.*	6.00	6.00	6.00	6.00	6.00
Straits tin, spot, N. Y.	24.50	24.00	...	...	23.95
Zinc, East St. Louis	3.10	3.05	3.05	3.05	3.05
Zinc, New York	3.47	3.42	3.42	3.42	3.42
Lead, St. Louis	3.10	3.00	3.00	3.00	3.00
Lead, New York	3.25	3.25	3.15	3.15	3.15

*Refinery quotations; price ½c. higher delivered in the Connecticut Valley.

Aluminum, 98 to 99 per cent pure, 22.50c. a lb., delivered.
Nickel, electrolytic cathode, 35c. a lb., delivered; shot and ingot, 36c. a lb., delivered.
Antimony, 5.62½c. a lb., New York.
Brass ingots, 85-5-5-5, 8.25c. a lb., New York and Philadelphia.

From New York Warehouse

Delivered Prices, Base per Lb.

Tin, Straits pig	26.00c. to 27.00c.
Tin, bar	28.00c. to 30.00c.
Copper, Lake	7.75c. to 8.75c.
Copper, electrolytic	7.50c. to 8.50c.
Copper, casting	7.50c. to 8.25c.
*Copper sheets, hot-rolled	15.87½c.
*High brass sheets	12.50c.
*Seamless brass tubes	15.25c.
*Seamless copper tubes	14.37½c.
*Brass rods	10.25c.
Zinc, slabs	4.37½c. to 4.87½c.
Zinc sheets (No. 9), casks	9.25c. to 9.50c.
Lead, American pig	3.87½c. to 4.37½c.
Lead, bar	6.37½c. to 6.87½c.
Lead sheets	6.75c.
Antimony, Asiatic	8.00c. to 9.00c.
Alum., virgin, 99 per cent. plus	23.00c.
Alum., No. 1 for remelting, 98 to 99 per cent.	16.00c.
Solder, ½ and ½	15.50c. to 16.50c.
Babbitt metal, commercial grade	21.00c. to 72.00c.

*These prices are also for delivery from Chicago and Cleveland warehouses.

From Cleveland Warehouse

Delivered Prices per Lb.

Tin, Straits pig	27.75c.
Tin, bar	29.75c.
Copper, Lake	7.25c.
Copper, electrolytic	7.25c.
Copper, casting	6.875c.
Zinc, slab	4.25c. to 4.50c.
Lead, American pig	4.00c. to 4.25c.
Lead, bar	7.25c.
Antimony, Asiatic	8.50c.
Babbitt metal, medium grade	16.50c.
Babbitt metal, high grade	32.00c.
Solder, ½ and ½	17.50c.

Old Metals, Per Lb., New York

Buying prices are paid by dealers for miscellaneous lots from smaller accumulators, and selling prices are those charged to consumers after the metal has been prepared for their uses. (All prices are nominal.)

	Dealers' Buying Prices	Dealers' Selling Prices
Copper, hvy. crucible	4.625c.	5.375c.
Copper, hvy. and wire	4.50c.	5.25c.
Copper, light and bottoms	3.625c.	4.25c.
Brass, heavy	2.50c.	3.00c.
Brass, light	2.00c.	2.50c.
Hvy. machine composition	3.25c.	4.00c.
No. 1 yel. brass turnings	2.50c.	3.00c.
No. 1 red brass or comp. turnings	3.00c.	3.75c.
Lead, heavy	2.375c.	2.75c.
Zinc	1.375c.	1.75c.
Cast aluminum	2.75c.	4.25c.
Sheet aluminum	6.50c.	8.00c.

Birmingham Steel Trade Holds at Steady Rate

BIRMINGHAM, Oct. 10.—Shipments and sales of pig iron last week totaled about the same as those of the preceding week, the new month and new quarter having brought little improvement in the market. Shipments this month are said to have started perhaps just a bit under those of September, but are expected to improve as the month advances. Spot buying prevails.

Four blast furnaces are active, the same as last week. The latest stack to go into operation was that of the Sloss-Sheffield Steel & Iron Co., blown in on foundry iron on Oct. 4. Woodward Iron Co. continues to operate two stacks on foundry iron and the Tennessee company has the Fairfield No. 6 in operation on basic iron. The Republic Steel Corpn. may blow in a furnace on foundry iron this week. The base quotation is said to be firm at $11 for the Southern market.

Steel

Little difference is noted in the steel market, fair conditions prevailing. September proved to be the best month of the year for finished steel and there has been no appreciable decline in the flow of orders, although some hold that October tonnage may fall below that of September. Sheets show the best activity, but increased interest is being manifested in reinforcing bars owing to large Southern road lettings.

There has been no change in the number of open-hearths operated in the State, the total continuing at eight.

Scrap

The market is quiet. Inquiries are scarce and sales limited. Prices are unchanged.

Railroad Equipment

Pacific Fruit Express is inquiring for 150 to 300 steel car underframes.

Western Fruit Express has ordered 100 underframes from Minneapolis Steel & Machinery Co.

Prices of Finished and Semi-Finished Steel, Coke, Coal, Cast Iron Pipe

BARS, PLATES, SHAPES

Iron and Steel Bars

Soft Steel

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Philadelphia	1.91c.
Del'd New York	1.95c.
Del'd Detroit	1.80c.
F.o.b. Cleveland	1.65c.
F.o.b. Lackawanna	1.70c.
F.o.b. Birmingham	1.75c.
C.i.f. Pacific ports	2.10c.

Billet Steel Reinforcing
(as quoted by distributers)

F.o.b. P'gh mills, 40, 50, 60-ft.	1.60c.
F.o.b. Birmingham, mill lengths	1.75c.
F.o.b. Cleveland	1.60c. to 1.75c.

Rail Steel

F.o.b. mills, east of Chicago dist.	1.35c. to 1.45c.
F.o.b. Chicago Heights mills	1.50c.

Iron

Common iron, f.o.b. Chicago	1.60c.
Refined iron, f.o.b. P'gh mills	2.75c.
Common iron, del'd Philadelphia	2.11c.
Common iron, del'd New York	2.15c.

Tank Plates

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.7935c.
F.o.b. Coatesville	1.70c.
F.o.b. Sparrows Point	1.70c.
Del'd New York	1.898c.
C.i.f. Pacific ports	2.00c.

Structural Shapes

	Base per Lb.
F.o.b. Pittsburgh mill	1.60c.
F.o.b. Chicago	1.70c.
F.o.b. Birmingham	1.75c.
F.o.b. Lackawanna	1.70c.
F.o.b. Bethlehem	1.70c.
Del'd Cleveland	1.8035c.
Del'd Philadelphia	1.7495c.
Del'd New York	1.86775c.
C.i.f. Pacific ports (standard)	2.10c.
C.i.f. Pacific ports (wide flange)	2.20c.

Steel Sheet Piling

	Base per Lb.
F.o.b. Pittsburgh	1.90c.
F.o.b. Chicago mill	2.05c.
F.o.b. Buffalo	2.00c.

Alloy Steel Bars

(F.o.b. maker's mill)

Alloy Quantity Bar Base, 2.45c. to 2.65c. per Lb.

S.A.E. Series Numbers	Alloy Differential per 100 Lb.
2000 (1½% Nickel)	$0.25
2100 (1½% Nickel)	0.55
2300 (3½% Nickel)	1.50
2500 (5% Nickel)	2.25
3100 Nickel Chromium	0.55
3200 Nickel Chromium	1.35
3300 Nickel Chromium	3.80
3400 Nickel Chromium	3.20
4100 Chromium Molybdenum (0.16 to 0.25 Molybdenum)	0.50
4100 Chromium Molybdenum (0.25 to 0.40 Molybdenum)	0.70
4600 Nickel Molybdenum (0.20 to 0.30 Molybdenum, 1.50 to 2.00 Nickel)	1.05
5100 Chromium Steel (0.60 to 0.90 Chromium)	0.35
5100 Chromium Steel (0.80 to 1.10 Chromium)	0.45
6100 Chromium Spring Steel	0.20
6100 Chromium Vanadium Bar	1.20
6100 Chromium Vanadium Spring Steel	0.95
9250 Silicon Manganese Spring Steel (flats)	0.25
Rounds and Squares	0.50
Chromium Nickel Vanadium	1.50
Carbon Vanadium	0.95

Above prices are for hot-rolled steel bars, forging quality. The differential for cold-drawn bars is ⅝c. a lb. higher, with standard classification for cold-finished alloy steel bars applying. For billets 4 x 4 to 10 x 10 in., the price for a gross ton is the net price for bars of the same analysis.

Billets under 4 x 4 in. carry the steel bar base. Slabs with a section area of 16 in. or over carry the billet price. Slabs with sectional area of less than 16 in. or less than 2½ in. thick, regardless of sectional area, take the bar price.

Cold Finished Bars*

	Base per Lb.
Bars, f.o.b. Pittsburgh mill	1.70c.
Bars, f.o.b. Chicago	1.75c.
Bars, Cleveland	1.75c.
Bars, Buffalo	1.75c.
Bars, Detroit	1.90c.
Bars, eastern Michigan	1.95c.
Shafting, ground, f.o.b. mill	†2.05c. to 3.00c.

*In quantities of 10,000 to 19,999 lb.
†According to size.

SHEETS, STRIP, TIN PLATE, TERNE PLATE

Sheets

Hot-Rolled

	Base per Lb.
No. 10 f.o.b. Pittsburgh	1.55c.
No. 10 f.o.b. Chicago mill	1.65c.
No. 10 del'd Philadelphia	1.86c.
No. 10 f.o.b. Birmingham	1.70c.
No. 10, c.l.f. Pacific Coast ports	2.17½c.

Hot-rolled and Annealed

No. 10, Pittsburgh	1.70c.
No. 10, Chicago mills	1.80c.
No. 10, Birmingham	1.85c.
No. 10, Pacific Coast ports	2.32½c.

Hot-Rolled Annealed

No. 24, f.o.b. Pittsburgh	2.20c.
No. 24, f.o.b. Chicago mills	2.30c.
No. 24, del'd Philadelphia	2.51c.
No. 24, f.o.b. Birmingham	2.35c.
No. 24, c.l.f. Pacific Coast ports	2.85c.

Heavy Cold-Rolled

No. 10 gage, f.o.b. Pittsburgh	2.10c. to 2.20c.
No. 10 gage, f.o.b. Chicago mills	2.25c. to 2.35c.
No. 10, gage, del'd Philadelphia	2.46c. to 2.56c.

Light Cold-Rolled

No. 20 gage, f.o.b. Pittsburgh	2.60c. to 2.70c.
No. 20 gage, f.o.b. Chicago Mills	2.70c. to 2.80c.
No. 20 gage, del'd Philadelphia	2.91c. to 3.01c.

Automobile Body Sheets

No. 20, f.o.b. Pittsburgh	2.65c. to 2.75c.

Steel Furniture Sheets

No. 10, f.o.b. Pittsburgh	2.50c. to 2.65c.
No. 20, f.o.b. Pittsburgh	3.00c. to 3.15c.

(Prices on furniture stock include stretcher leveling but not resquaring.)

Galvanized Sheets

No. 24, f.o.b. Pittsburgh	2.85c.
No. 24, f.o.b. Chicago mills	2.95c.
No. 24, del'd Philadelphia	3.16c.
No. 24, f.o.b. Birmingham	3.00c.
No. 24, c.l.f. Pacific Coast ports	3.50c.

Long Ternes

No. 24, unassorted, 8-lb. coating, f.o.b. P'gh	2.80c.

Vitreous Enameling Stock

No. 10, f.o.b. Pittsburgh	2.50c. to 2.60c.
No. 20, f.o.b. Pittsburgh	3.00c. to 3.10c.

Tin Mill Black Plate

No. 28, f.o.b. Pittsburgh	2.30c. to 2.40c.
No. 28, Chicago mill	2.40c. to 2.50c.

Tin Plate

	Base per Box
Standard cokes, f.o.b. P'gh district mill	$4.75
Standard cokes, f.o.b. Gary	4.85

Terne Plate

(F.o.b. Morganatown or Pittsburgh)
(Per Package, 20 x 28 in.)

8-lb. coating I.C.	$9.50
15-lb. coating I.C.	12.00
20-lb. coating I.C.	13.00
25-lb. coating I.C.	14.10
30-lb. coating I.C.	14.90
40-lb. coating I.C.	16.70

Hot-Rolled Hoops, Bands, Strips and Flats under ¼ in.

	Base per Lb.
All widths up to 24 in., Pittsburgh	1.45c.
All widths up to 24 in., Chicago	1.55c.
Cooperage stock, P'gh	1.55c. to 1.60c.
Cooperage stock, Chicago	1.65c. to 1.70c.

Cold-Rolled Strips

F.o.b. Pittsburgh	1.90c. to 2.00c.
F.o.b. Cleveland	1.90c. to 2.00c.
Del'd Chicago	2.20c. to 2.30c.
F.o.b. Worcester	2.20c.
Fender stock, No. 20 gage, Pittsburgh or Cleveland	2.75c. to 2.85c.

WIRE PRODUCTS

(Carload lots, f.o.b. Pittsburgh and Cleveland)

(After Dec. 31, extras of 10c. a 100 lb. on mixed and joint carloads, 25c. on pool carloads and 40c. on less than carloads will be applied on all merchant wire products.)

To Manufacturing Trade

	Base per Keg
Bright wire	2.20c.
Spring wire	3.20c.

To Jobbing Trade

	Base per Keg
Standard wire nails	$1.95
Smooth coated nails	1.95
Galvanized nails	3.95

	Base per Lb.
Smooth annealed wire	2.35c.
Smooth galvanized wire	2.80c.
Polished staples	2.50c.
Galvanized staples	2.75c.
Barbed wire, galvanized	2.60c.
Woven wire fence, No. 9 gage, per net ton	$55.00
Woven wire fence, No. 12½ gage and lighter, per net ton	60.00

Chicago and Anderson, Ind., mill prices are $1 a ton over Pittsburgh base; Duluth, Minn., and Worcester, Mass., mill $2 a ton over Pittsburgh, and Birmingham mill $3 a ton over Pittsburgh.

STEEL PIPE AND TUBING

Welded Pipe

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

Butt Weld

Steel Inches	Steel Black	Steel Galv.	Iron Inches	Iron Black	Iron Galv
⅛	51½	28½	⅛	+9½	+12½
¼ to ⅜	57	34	¼ & ⅜	+5	+20½
½	62	40½	½	28	19½
¾	65½	55	¾	33	16½
1 to 3	67½	57	1 & 1¼	36	20½
			1½	40	23
			2	38	21

Lap Weld

2	61	50½	2	26	12½
2½ to 6	64½	54	2½ to 3½	33	18½
7 and 8	62	51	4 to 6	35	22
9 and 10	60	49	7 and 8	34	21½
11 and 12	59	48	9 to 12	31	16½

Butt Weld, extra strong, plain ends

⅛	48	33	⅛	+17	+40½
¼ to ⅜	53½	38½	¼ & ⅜	+7	+41
½	59	49½	½	28	12½
¾	63½	54	¾	33	17½
1 to 1½	65½	56	1 to 2	39	23
2 to 3	66½	57			

Lap Weld, extra strong, plain ends

2	59	49½	2	24	18½
2½ to 4	62½	53	2½ to 4	29	25
4½ to 6	62	52½	4½ to 6	28	24
7 to 8	58	47	7 & 8	26	22
9 and 10	51½	40½	9 to 12	26	13½
11 and 12	50½	39½			

Discounts on steel and wrought iron pipe are net and not subject to any points or preferentials.

Note—Chicago district mills have a base two points less than the above discounts. Chicago delivered base is 2½ points less. Freight is figured from Pittsburgh, Lorain, Ohio, and Chicago district mills, the billing being from the point producing the lowest price to destination.

Boiler Tubes

Base Discounts, f.o.b. Pittsburgh

Steel		Charcoal Iron	
2 in. and 2¼ in.	38	1½ in.	1
2½ in.—2¾ in.	46	1¾ in.	8
3 in.	52	2 in.—2¾ in.	13
3¼ in.—3¾ in.	54	3 in.	17
4 in.	57	2½ in.—2¾ in.	16
4½ in. to 6 in.	46	3¼ in. to 3½ in.	18
		4 in.	20
		4½ in.	21

On lots of a carload or more, the above base discounts are subject to a preferential of two fives on steel and of 10 per cent on charcoal iron tubes. Smaller quantities are subject to the following modifications from the base discounts:

Lap Welded Steel—Under 10,000 lb., 6 points under base and one five; 10,000 lb. to carload, 4 points under base and two fives. Charcoal Iron—Under 10,000 lb., 2 points under base; 10,000 lb. to carload, base and one five.

Standard Commercial Seamless Boiler Tubes

Cold-Drawn

1 in.	61	3 in.	46
1¼ to 1½ in.	53	3¼ to 3½ in.	48
1¾ in.	37	4 in.	51
2 to 2¼ in.	32	4½, 5 and 6 in.	40
2½ to 2¾ in.	40		

Hot Rolled

2 and 2¼ in.	38	3¼ to 3½ in.	54
2½ and 2¾ in.	46	4 in.	57
3 in.	52	4½, 5 and 6 in.	46

Beyond the abve base discounts a preferential discount of 5 per cent is allowed on carload lots. On less than carloads to 10,000 lb., base discounts are reduced 4 points with 5 per cent preferential; on less than 10,000 lb., base discounts are reduced 6 points with no preferential. No extra for lengths up to and including 24 ft. Sizes smaller than 1 in. in lighter than standard gages takes the mechanical tube list and discounts. Intermediate sizes and gages not listed take price of next larger outside diameter and heavier gage.

Seamless Mechanical Tubing

	Per Cent Off List
Carbon, 0.10% to 0.30% base (carloads)	55
Carbon, 0.30% to 40% base	50

Plus differential for lengths over 18 ft. and for commercial exact lengths. Warehouse discounts on small lots are less than the above.

RAILS AND TRACK SUPPLIES

Rails

	Per Gross Ton
Standard, f.o.b. mill	$43.00
Light (from billets), f.o.b. mill	32.00
Light (from rail steel, f.o.b. mill)	$28.00 to $30.00

Track Equipment

	Base per 100 Lb.
Spikes, 9/16-in. and large	$2.40
Spikes, ½-in. and large	2.40
Spikes, boat and barge	2.60
Tie plate, steel	1.85
Angle bars	2.75
Track bolts, to steam railroads	3.50
Track bolts, to jobbers, all sizes, per 100 count	73 per cent off list

BOLTS, NUTS, RIVETS AND SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

	Per Cent Off List
(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)	
†Machine bolts	75
†Carriage bolts	75
Lag bolts	75
Plow bolts, Nos. 1, 2, 3 and 7 heads	75
Hot-pressed nuts, blank or tapped, square	75
Hot-pressed nuts, blank or tapped, hexagons	75
C.p.c. and t. square or hex nuts, blank or tapped	75
Washers*	7.00c. to 6.75c. per lb. off list

*F.o.b. Chicago, New York and Pittsburgh.
†Bolts with rolled thread up to and including ⅝ in. x 6 in. take 10 per cent lower list prices.

Bolts and Nuts

	Per Cent Off List
Semi-finished hexagon nuts	75
Semi-finished hexagon castellated nuts, S.A.E.	75
Stove bolts in packages, P'gh	77½, 25 and 10
Stove bolts in packages, Ch'go	77½, 25 and 10
Stove bolts in pkgs., Cleveland	77½, 25 and 10
Stove bolts in bulk, P'gh	88
Stove bolts in bulk, Chicago	86
Stove bolts in bulk, Cleveland	86
Tire bolts	60 and 10

Discount of 75 per cent off on bolts and nuts applies on carload business with jobbers and large consumers.

Large Rivets

(½-in. and larger)

	Base per Lb.
F.o.b. Pittsburgh or Cleveland	$2.25
F.o.b. Chicago	2.35

Small Rivets

(7/16-in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh	70, 10 and 5
F.o.b. Cleveland	70, 10 and 5
F.o.b. Chicago	70, 10 and 5

Cap and Set Screws

Discounts to Jobbers
(Freight allowed up to but not exceeding 50c. per 100 lb. on lots of 200 lb. or more)

	Per Cent Off List
Milled cap screws, 1 in. dia. and smaller	80 and 25
Milled standard set screws, case hardened, 1 in. dia. and smaller	75 and 10
Milled headless set screws, cut thread, ⅝ in. and smaller	75 and 10
Upset hex. head cap screws, U.S.S.S. or S.A.E. thread, 1 in. dia. and smaller	80, 25 and 10
Upset set screws, sq. head, 1 in. dia. and smaller	75, 10 and 10
Upset set screws, 1⅛ in. and larger	75 and 10
Milled studs	70

SEMI-FINISHED STEEL

Billets and Blooms

	Per Gross Ton
Rerolling, 4-in. and under 10-in., Pittsburgh	$26.00
Rerolling, 4-in. and under 10-in., Youngstown	26.00
Rerolling, 4-in. and under 10-in., Cleveland	26.00
Rerolling, 4-in. and under 10-in., Chicago	26.00
Forging quality, Pittsburgh	33.00
Forging quality, Youngstown	33.00

Sheet Bars

(Open-Hearth or Bessemer)

	Per Gross Ton
Pittsburgh	$26.00
Youngstown	26.00
Cleveland	26.00

Slabs

(8 in. x 2 in. and under 10 in. x 10 in.)

	Per Gross Ton
Pittsburgh	$26.00
Youngstown	26.00
Cleveland	26.00

(Turn to next page)

(F.o.b. Pittsburgh or Youngstown)

	Per Lb.
Grooved	1.60c.
Universal	1.60c.
Sheared	1.60c.

Wire Rods

(Common soft, base)

	Per Gross Ton
Pittsburgh	$37.00
Cleveland	37.00
Chicago	38.00

COKE, COAL AND FUEL OIL

Coke

	Per Net Ton
Furnace, f.o.b. Connellsville, Prompt	$1.75 to $2.00
Furnace, f.o.b. Connellsville, prompt	2.75 to 4.25
Foundry, by-product, Chicago ovens, for delivery outside switching districts	7.00
Foundry, by-product, delivered in Chicago switching district	7.75
Foundry, by-product, New England, delivered	10.09
Foundry, by-product, Newark or Jersey City, del'd	8.20 to 8.81
Foundry, by-product, Phila.	9.00
Foundry, by-product, Cleveland, delivered	7.82
Foundry, Birmingham	5.00
Foundry, by-products, St. Louis, f.o.b., ovens	8.00
Foundry, by-products, del'd St. Louis	9.00

Coal

	Per Net Ton
Mine run steam coal, f.o.b. W. Pa. mines	$1.20 to $1.30
Mine run coking coal, f.o.b. W. Pa.	1.30 to 1.40
Gas coal, ¾-in., f.o.b. Pa. mines	1.30 to 1.40
Mine run gas coal, f.o.b. Pa. mines	1.30 to 1.40
Steam slack, f.o.b. W. Pa. mines	0.50 to 0.65
Gas slack, f.o.b. W. Pa. mines	0.50 to 0.65

Fuel Oil

Per Gal. f.o.b. Bayonne, N. J.	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. f.o.b. Baltimore	
No. 3 distillate	4.00c.
No. 4 industrial	3.50c.
Per Gal. del'd Chicago	
No. 3 industrial fuel oil	2.75c.
No. 5 industrial fuel oil	2.45c.
Per Gal. f.o.b. Cleveland	
No. 3 distillate	5.00c.
No. 4 industrial	4.50c.

REFRACTORIES

Fire Clay Brick

	Per 1000 f.o.b. Works High-heat Duty Brick	Intermediate Duty Brick
Penn.	$35.00	$25.00 to $30.00
Maryland	35.00	25.00 to 30.00
New Jer.	$44.00 to 57.00	
Ohio	35.00	25.00 to 30.00
Kentucky	35.00	25.00 to 30.00
Missouri	35.00	30.00
Illinois	35.00	25.00 to 30.00
Ground fire clay, per ton	6.50	

Chrome Brick

	Per Net Ton
Standard size	$42.50

Silica Brick

	Per 1000 f.o.b. Works
Pennsylvania	$38.00
Chicago	47.00
Birmingham	50.00
Silica clay, per ton	8.00

Magnesite Brick

	Per Net Ton
Standard sizes, burned, f.o.b. Baltimore and Chester, Pa.	$61.50
Unburned, f.o.b. Baltimore	52.00
Grain magnesite, f.o.b. Baltimore and Chester, Pa.	38.50
Domestic, f.o.b. Chewelah, Wash.	20.90

CAST IRON PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$38.40 to $41.40
4-in., del'd Chicago	41.40 to 44.40
6-in., and larger, del'd New York	33.30
4-in., del'd New York	36.30
6-in., and larger, Birm'ham	$32.00 to 32.00
4-in., Birmingham	35.00 to 36.00

Class "A" and gas pipe, $3 extra.

Pig Iron, Ores, Ferroalloys

VALLEY

Per gross ton, f.o.b. Valley furnace:

Basic	$13.50
Bessemer	15.00
Gray forge	14.50
No. 2 foundry	14.50
No. 3 foundry	14.00
Malleable	$14.50 to 15.00
Low phos., copper free	23.00 to 25.00

Freight rate to Pittsburgh or Cleveland district, $1.89.

PITTSBURGH

Per gross ton, f.o.b. Pittsburgh district furnace:

Basic	$14.00
No. 2 foundry	15.00
No. 3 foundry	14.50
Malleable	15.00
Bessemer	15.00

Freight rates to points in Pittsburgh district range from 69c. to $1.26.

CHICAGO

Per gross ton at Chicago furnace:

N'th'n No. 2 fdy.	$15.50
N'th'n No. 1 fdy.	16.00
Malleable, not over 2.25 sil.	15.50
High phosphorus	15.50
Lake Super. charcoal, sil. 1.50, by rail	23.17
Southern No. 2 fdy.	16.14
Low phos., sil. 1 to 2, Copper free	25.00
Silvery, sil. 8 per cent	23.67
Bess. ferrosil'n, 15 per cent	28.92

Prices are delivered consumers' yards except on Northern foundry, high phosphorus and malleable, which are f.o.b. local furnaces, not including a switching charge.

ST. LOUIS

Per gross ton at St. Louis:

No. 2 fdy., sil. 1.75 to 2.25, f.o.b. Granite City, Ill.	$17.50
Malleable, f.o.b. Granite City	17.50
Northern No. 2 fdy., del'd St. Louis	$18.30 to 18.80
Southern No. 2 fdy. del'd.	14.56
Northern malleable, del'd.	18.30 to 18.80
Northern basic, deliv'd.	18.30 to 18.80

Freight rates 83c. (average) Granite City to St. Louis; $2.30 from Chicago; $4.56 from Birmingham.

NEW YORK

Per gross ton, delivered New York district:

*Buffalo, No. 2, del'd east N. J.	$17.41 to $17.66
East Pa. No. 2 fdy.	15.02 to 15.52
East Pa. No. 2X fdy.	15.52 to 16.02

Freight rates: $1.52 to $2.63 from eastern Pennsylvania.

* Prices delivered to New Jersey cities having rate of $3.41 a ton from Buffalo.

BUFFALO

Per gross ton, f.o.b. furnace:

No. 2 fdy.	$16.00
No. 2X fdy.	16.50
No. 1 fdy.	17.50
Malleable, sil. up to 2.25	16.50
Basic	15.50
Lake Superior charcoal, del'd	23.41

NEW ENGLAND

Per gross ton delivered to most New England points:

*Buffalo, sil. 1.75 to 2.25	$19.65
*Buffalo, sil. 2.25 to 2.75	19.65
†Buffalo, sil. 1.75 to 2.25	17.41
†Buffalo, sil. 2.25 to 2.75	17.41
†Ala., sil. 1.75 to 2.25	15.64
†Ala., sil. 2.25 to 2.75	16.14

Freight rates: $5.05 all rail from Buffalo, and $3.41 to $3.91 rail and water from Buffalo when $1 barge and $2 to $2.50 New England freight rate are obtainable; $5.64 rail and water from Alabama to New England seaboard.

* All-rail rate.

† Rail-and-water rate.

CINCINNATI

Per gross ton, delivered Cincinnati:

Ala. fdy., sil. 1.75 to 2.25	$13.82
Ala. fdy., sil. 2.25 to 2.75	14.32
Tenn. fdy., sil. 1.75 to 2.25	13.82
N'th'n No. 2 foundry	$17.01 to 17.59
S'th'n Ohio silvery, 8%	21.02

Freight rates, $2.02 from Ironton and Jackson, Ohio; $3.82 from Birmingham.

PHILADELPHIA

Per gross ton at Philadelphia:

East. Pa. No. 2	$13.84 to $14.34
East. Pa. No. 2X	14.34 to 14.84
East. Pa. No. 1X	14.84 to 15.34
Basic (del'd east. Pa.)	13.50 to 14.00
Malleable	16.50 to 18.00
Stand. low phos. (f.o.b. east. Pa. furnace)	20.50 to 21.50
Cop. b'r'g low phos. (f.o.b. furnace)	20.50 to 21.50
Va. No. 2	21.79
Va. No. 2X	22.29
Va. No. 2 plain	21.54 to 22.04
Va. No. 2X	22.04 to 22.54

Prices, except as specified otherwise, are deliv'd Philadelphia. Freight rates: 84c. to $1.79 from eastern Pennsylvania furnaces; $4.67 from Virginia furnaces.

CLEVELAND

Per gross ton at Cleveland furnace:

N'th'n No. 2 fdy. (local delivery)	$15.00
S'th'n fdy. sil. 1.75 to 2.25	16.14
Malleable (local delivery)	15.00
Ohio silvery, 8 per cent	21.87
Stand. low. phos., Valley	23.00

Prices are f.o.b. furnace except on Southern foundry and silvery iron. Freight rates: 63c. average local switching charge; $3.12 from Jackson, Ohio; $6.14 from Birmingham.

BIRMINGHAM

Per gross ton, f.o.b. Birmingham dist. furnace:

No. 2 fdy., 1.75 to 2.25 sil.	$11.00
No. 2 soft, 2.25 to 2.75 sil.	11.50
Basic	11.00

CANADA

Per gross ton:

Delivered Toronto

No. 1 fdy., sil. 2.25 to 2.75	$22.60
No. 2 fdy., sil. 1.75 to 2.25	22.10
Malleable	22.60

Delivered Montreal

No. 1 fdy., sil. 2.25 to 2.75	$24.00
No. 2 fdy., sil. 1.75 to 2.25	23.50
Malleable	24.00
Basic	$23.00 to 23.50

Ferromanganese

	Per Gross Ton
Domestic, 80%, seaboard	$68.00
Foreign, 80%, Atlantic or Gulf port, duty paid	68.00

Prices for lots of one carload or more; extras applied on less than carload lots.

Spiegeleisen

	Per Gross Ton Furnace
Domestic, 19 to 21%	$25.00

Electric Ferrosilicon

	Per Gross Ton Delivered
50% (carloads)	$77.50
50% (less carloads)	85.00
75% (carloads)	126.00
75% (less carloads)	136.00
14% to 16% (f.o.b.) Welland, Ont., in carloads	31.00
14% to 16% (less carloads)	36.00

Bessemer Ferrosilicon

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
10%	$20.50	14%	$23.50
11%	21.00	15%	24.00
12%	21.50	16%	25.00
13%	22.50	17%	26.50

Silvery Iron

F.o.b. Jackson County, Ohio, Furnace

Per Gross Ton		Per Gross Ton	
6%	$18.00	12%	$20.50
7%	18.50	13%	21.50
8%	18.75	14%	22.50
9%	19.00	15%	23.00
10%	19.50	16%	24.00
11%	20.00	17%	25.50

Other Ferroalloys

Ferrotungsten, per lb. wo. del., carloads	$1.08
Ferrotungsten, less carloads	$1.15 to $1.2
Ferrochromium, 4 to 6% carbon and up, 65 to 70% Cr., per lb. contained Cr, delivered, in carloads	10.00c
Ferrochromium, 2% carbon	17.00c to 17.50c
Ferrochromium, 1% carbon	19.00c to 20.00c
Ferrochromium, 0.10% carbon	23.50 to 25.00c
Ferrochromium, 0.06% carbon	25.50c to 27.00c
Ferrovanadium, del., per lb. contained Va.	$3.05 to $3.30
Ferrocarbontitanium, 15 to 18%, per net ton, f.o.b. furnace in carloads	160.00
Ferrophosphorus, electric, or blast furnace material, in carloads, 18%, Rockdale, Tenn., base per gross ton with $2 unitage	50.00
Ferrophosphorus, electric, 24% f.o.b. Anniston, Ala., per gross ton with $2.75 unitage	65.00
Ferromolybdenum, per lb. Mo., del.	95c.
Calcium molybdate, per lb. Mo., del.	80c.
Silico spiegel, per ton, f.o.b. furnace, car lots	42.50
Ton lots or less, per ton	47.50
Silico-manganese, gross ton, delivered:	
2.50% carbon grade	105.00
1% carbon grade	115.00
Spot prices	$5 a ton higher

Ores

Lake Superior Ores, Delivered Lower Lake Ports

	Per Gross Ton
Old range Bessemer, 51.50% iron	$4.80
Old range non-Bessemer, 51.50% iron	4.65
Mesabi Bessemer, 51.50% iron	4.65
Mesabi non-Bessemer, 51.50% iron	4.50
High phosphorus, 51.50% iron	4.40

Foreign Ore, c.i.f. Philadelphia or Baltimore

	Per Unit
Iron, low phos., copper free, 55 to 58% iron, dry Spanish or Algerian	8c. to 8.50c.
Iron, low phos., Swedish, average 68½% iron	9c.
Iron, basic or foundry, Swedish, average 65% iron	8c.
Iron, basic or foundry, Russian, aver. 63% iron (nom.)	9c.
Manganese, Caucasian, washed 52%	*23c.
Manganese, African, Indian, 50-52%	*21c. to 22c.
Manganese, Brazilian, 46 to 48%	*18c.

	Per Gross Ton
Tungsten, Chinese wolframite	$10.00 to $10.25
Tungsten, domestic scheelite	$8.00 to $10.40
Chrome, 45%, Cr_2O_3, crude, c.i.f. Atlantic seaboard	16.00
Chrome, 48%, Cr_2O_3, c.i.f. Atlantic seaboard	18.00

*Quotations nominal in absence of sales.

Fluorspar

	Per Net Ton
Domestic, washed gravel, 85-5, f.o.b. Kentucky and Illinois mines	$10.00
No. 2 lump, 85-5, f.o.b. Kentucky and Illinois mines	12.00
Foreign, 85% calcium fluoride, not over 5% silicon, c.i.f. Atlantic port, duty paid	$16.00 to 16.75
Domestic, No. 1 ground bulk, 85 to 98% calcium fluoride, not over 2½% silicon, f.o.b. Illinois and Kentucky mines	30.00

Iron and Steel Scrap

PITTSBURGH

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$9.50 to $10.00
No. 2 heavy melting steel	7.75 to 8.25
No. 2 railroad wrought	9.50 to 10.00
Scrap rails	9.50 to 10.00
Rails 3 ft. and under	10.50 to 11.00
Sheet bar crops, ordinary	9.50 to 10.00
Compressed sheet steel	9.25 to 9.75
Hand bundled sheet steel	8.00 to 8.50
Hvy. steel axle turnings	7.50 to 8.00
Machine shop turnings	6.00 to 6.50
Short shov. steel turnings	6.00 to 6.50
Short mixed borings and turnings	6.00 to 6.50
Cast iron borings	6.00 to 6.50
Cast iron carwheels	8.00 to 8.50
Heavy breakable cast	8.00 to 8.50
No. 1 cast	9.50 to 10.50
Railr. knuckles and couplers	10.00 to 10.50
Rail. coil and leaf springs	10.00 to 10.50
Rolled steel wheels	10.00 to 10.50
Low phos. billet crops	10.50 to 11.00
Low phos. sheet bar crops	11.50 to 12.00
Low phos. plate scrap	10.50 to 11.00
Low phos. punchings	10.50 to 11.00
Steel car axles	11.00 to 11.50

CHICAGO

Delivered Chicago district consumers:

	Per Gross Ton
Heavy melting steel	$6.00
Shoveling steel	6.00
Frogs, switches and guards	$6.00
Hydraulic comp. sheets	4.00 to 4.50
Drop forge flashings	4.00 to 4.50
No. 1 busheling	4.00 to 4.50
Rolled carwheels	8.00 to 8.50
Railroad tires	7.50 to 8.00
Railroad leaf springs	8.00 to 8.50
Axle turnings	4.50 to 5.00
Steel couplers and knuckles	7.00 to 7.50
Coil springs	8.50 to 9.00
Axle turnings (elec. fur.)	5.50 to 6.00
Low phos. punchings	8.00 to 8.50
Low phos. plates, 12 in. and under	8.00 to 8.50
Cast iron borings	4.00 to 4.50
Short shoveling turnings	4.00 to 4.50
Machine shop turnings	2.75 to 3.75
Rerolling rails	8.00 to 8.50
Steel rails, less than 3 ft.	8.25 to 8.75
Steel rails, less than 2 ft.	8.75 to 9.25
Angle bars, steel	7.00 to 7.50
Cast iron carwheels	7.00 to 7.50
Railroad malleable	6.75 to 7.25
Agricultural malleable	5.00 to 5.50
* Relaying rails, 56 to 60 lb.	15.00 to 17.00
* Relay rails, 65 lb. and up	18.00 to 23.00

Per Net Ton

Iron angle and splice bars	$5.00 to $5.50
Iron arch bars, transoms	5.00 to 5.50
Iron car axles	11.00 to 11.50
Steel car axles	9.00 to 9.50
No. 1 railroad wrought	4.50 to 5.00
No. 2 railroad wrought	5.00 to 5.50
No. 1 busheling	2.50 to 3.00

No. 2 bushelling	$2.00 to	$2.50
Locomotive tires, smooth	7.50 to	8.50
Pipe and flues	1.25 to	1.75
No. 1 machinery cast	6.25 to	6.75
Clean automobile cast	6.75 to	7.25
No. 1 railroad cast	5.50 to	6.00
No. 1 agricultural cast	5.75 to	6.25
Stove plate	5.50 to	6.00
Grate bars	5.25 to	5.75
Brake shoes	6.25 to	6.75

*Relaying rails, including angle bars to match, are quoted f.o.b. dealers' yards.

PHILADELPHIA

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$7.00 to	$7.50
No. 2 heavy melting steel	5.50 to	6.00
No. 1 railroad wrought	7.50 to	8.00
Bundled sheets	4.00 to	4.50
Hydraulic compressed, new	6.00 to	6.50
Hydraulic compressed, old	4.00 to	4.50
Machine shop turnings	3.50 to	4.00
Heavy axle turnings	5.50 to	6.00
Cast borings (nom.)	3.00 to	3.50
Heavy breakable cast	9.00 to	9.50
Stove plate (steel works)	6.50 to	7.00
No. 1 low phos. heavy	10.00 to	10.50
Couplers and knuckles	9.00 to	9.50
Rolled steel wheels	9.00 to	9.50
No. 1 blast furnace (nom.)	3.00 to	3.50
Spec. iron and steel pipe	5.50 to	6.00
Shafting	11.00 to	11.50
Steel axles	12.00 to	13.00
No. 1 forge fire	5.50 to	6.00
Cast iron carwheels		10.00
No. 1 cast	9.50 to	10.00
Cast borings (chem.)	8.00 to	10.00
Steel rails for rolling	9.00 to	9.50

CLEVELAND

Per gross ton delivered consumers' yards:

No. 1 heavy melting steel	$7.00 to	$7.50
No. 2 heavy melting steel	6.50 to	7.00
Compressed sheet steel	6.50 to	7.00
Light bundled sheet stampings	4.50 to	5.00
Drop forge flashings	5.25 to	5.75
Machine shop turnings	4.50 to	5.00
Short shoveling turnings	4.50 to	5.00
No. 1 busheling	5.25 to	5.50
Steel axle turnings	5.00 to	5.50
Low phos., billet crops	10.00 to	11.00
Cast iron borings	4.50 to	5.00
Mixed borings and short turnings	4.50 to	5.00
No. 2 busheling	4.50 to	5.00
No. 1 cast	7.50 to	8.00
Railroad grate bars	5.00 to	5.50
Stove plate	5.00 to	5.50
Rails under 3 ft.	8.50 to	9.00
Rails for rolling	8.50 to	9.00
Railroad malleable	6.75 to	7.00
Cast iron carwheels	7.00 to	7.50

BUFFALO

Per gross ton, f.o.b. Buffalo consumers' plants:

No. 1 heavy melting steel	$7.00 to	$7.50
No. 2 heavy melting scrap	6.25 to	6.75
Scrap rails	6.75 to	7.25
New hydraul. comp. sheets	6.25 to	6.75
Old hydraul. comp. sheets		5.00
Drop forge flashings	6.25 to	6.75
No. 1 busheling	6.25 to	6.75
Hvy. steel axle turnings		6.00
Machine shop turnings	4.00 to	4.50
Knuckles and couplers		10.00
Coil and leaf springs		10.00
Rolled steel wheels		10.00
Low phos. billet crops	9.00 to	9.50
Short shov. steel turnings	5.50 to	6.00
Short mixed borings and turnings	3.75 to	4.25
Cast iron borings	3.75 to	4.25
No. 2 busheling	3.50 to	4.00
Steel car axles	10.00 to	11.00
Iron car axles	10.00 to	11.00
No. 1 machinery cast	9.50 to	10.00
No. 1 cupola cast	8.50 to	9.00
Stove plate	6.50 to	7.00
Steel rails, 3 ft. and under	9.25 to	9.75
Cast iron carwheels	8.00 to	9.00
Industrial malleable	7.00 to	7.50
Railroad malleable	7.00 to	7.50
Chemical borings	7.50 to	8.00

BIRMINGHAM

Per gross ton delivered consumers' yards:

Heavy melting steel	$7.50 to	$8.00
Scrap steel rails	8.00 to	8.50
Short shoveling turnings		4.00
Stove plate		6.00
Steel axles		9.00
Iron axles		9.00
No. 1 railroad wrought	4.50 to	5.00
Rails for rolling	8.00 to	8.50
No. 1 cast		8.50
Traction wheels		8.50
Cast iron borings, chem.		8.50

ST. LOUIS

Per gross ton delivered consumers' yards:

Selected heavy steel	$6.00 to	$6.50
No. 1 heavy melting	5.50 to	6.00
No. 2 heavy melting	5.00 to	5.50
No. 1 locomotive tires	5.00 to	5.50
Misc. stand-sec. rails	6.00 to	6.50
Railroad springs	7.25 to	7.75
Bundled sheets	2.00 to	2.50
No. 1 railroad wrought	5.00 to	5.50
No. 1 busheling	3.50 to	4.00
Cast iron borings and shoveling turnings	2.75 to	3.25
Iron rails	7.00 to	7.50
Rails for rolling	7.50 to	8.00
Machine shop turnings	1.50 to	2.00
Heavy turnings	2.00 to	2.50
Steel car axles	8.50 to	9.00
Iron car axles	11.00 to	11.50
Wrot. iron bars and trans.	5.00 to	5.50
No. 1 railroad wrought	3.50 to	4.00
Steel rails less than 3 ft.	7.50 to	8.00
Steel angle bars	6.00 to	6.50
Cast iron carwheels	5.50 to	6.00
No. 1 machinery cast	6.50 to	7.00
Railroad malleable	4.00 to	4.50
No. 1 railroad cast	6.25 to	6.75
Stove plate	5.50 to	6.00
Relay. rails, 60 lb. and under	16.00 to	16.50
Relay. rails, 60 lb. and over	20.00 to	21.00
Agricult. malleable	4.00 to	4.50

NEW YORK

Dealers' buying prices per gross ton:

No. 1 heavy melting steel	$4.00 to	$4.50
No. 2 heavy melting steel	2.75 to	3.00
Heavy melting steel (yard)		1.50
No. 1 hvy. breakable cast	5.00 to	5.25
Stove plate (steel works)	2.25 to	5.75
Machine shop turnings	0.75 to	1.25
Short shoveling turnings	0.75 to	1.25
Cast borings	0.50 to	1.00
No. 1 blast furnace	0.50 to	1.00
Steel car axles	8.00 to	8.50
Spec. iron and steel pipe	2.00 to	2.50
Forge fire		2.25
No. 1 railroad wrought	4.00 to	4.50
No. 1 yard wrought, long	3.25 to	3.50
Rails for rolling	5.00 to	5.50
No. 1 cast	5.50 to	6.00
No. 2 cast	4.50 to	5.00
Stove plate (foundry)		1.50
Malleable cast (railroad)	4.00 to	4.50
Cast borings (chemical)	6.00 to	6.50

Per gross ton, delivered local foundries:

No. 1 machinery cast	$9.00 to	$9.50
No. 1 hvy. cast (cupola size)	7.50 to	8.00
No. 2 cast	4.00 to	4.50

BOSTON

Dealers' buying prices per gross ton:

No. 1 heavy melting steel		$3.50
Scrap T rails		3.35
Machine shop turnings	$0.80 to	1.00
Cast iron borings		1.05
Bundled skeleton, long	2.00 to	2.10
Forge flashings	3.00 to	3.50
Blast furnace wrap	0.90 to	1.00
Forge scrap	3.00 to	3.25
Shafting	9.50 to	10.00
Steel car axles	9.00 to	9.50
Wrought pipe	4.00 to	4.25
Rails for rolling	4.50 to	5.00
Cast iron borings, chemical	7.00 to	7.25

Per gross ton delivered consumers' yards:

Textile cast	$7.00 to	$7.50
No. 1 machinery cast	7.50 to	8.00
Stove plate	5.00 to	5.25
Railroad malleable	8.00 to	8.50

CINCINNATI

Dealers' buying prices per gross ton:

Heavy melting steel	$6.00 to	$6.50
Scrap rails for melting	6.00 to	6.50
Loose sheet clippings	1.50 to	2.00
Bundled sheets	3.75 to	4.25
Cast iron borings	3.25 to	3.75
Machine shop turnings	3.00 to	3.50
No. 1 busheling	4.50 to	5.00
No. 2 busheling	2.75 to	3.25
Rails for rolling	6.50 to	7.00
No. 1 locomotive tires	7.50 to	8.00
Short rails	9.00 to	9.50
Cast iron carwheels	6.50 to	7.00
No. 1 machinery cast	8.25 to	8.75
No. 1 railroad cast	7.75 to	8.25
Burnt cast	4.25 to	4.75
Stove plate	4.25 to	4.75
Agricultural malleable	7.75 to	8.25
Railroad malleable	8.25 to	8.75

DETROIT

Dealers' buying prices per gross ton:

Hvy. melting steel	$5.50 to	$6.00
Borings and short turnings	2.75 to	3.25
Long turnings	2.75 to	3.25
No. 1 machinery cast	7.75 to	8.25
Automotive cast	8.50 to	9.00
Hydraul. comp. sheets	5.25 to	5.75
Stove plate	3.75 to	4.25
New No. 1 busheling	4.75 to	5.25
Old No. 2 busheling	1.50 to	2.00
Sheet clippings	2.00 to	2.50
Flashings	4.00 to	4.50

CANADA

Dealers' buying prices per gross ton:

	Toronto	Montreal
Heavy melting steel	$7.00	$6.00
Rails, scrap	7.00	6.00
No. 1 wrought	6.00	8.00
Machine shop turnings	2.00	2.00
Boiler plate	5.00	4.50
Heavy axle turnings	2.50	2.50
Cast borings	2.00	2.00
Steel borings	2.00	2.00
Wrought pipe	2.00	2.00
Steel axles	7.00	9.00
Axles, wrought iron	7.00	11.00
No. 1 machinery cast	12.50	10.00
Stove plate	10.00	8.00
Standard carwheels	10.00	8.50
Malleable	10.00	8.00

Warehouse Prices for Steel Products

PITTSBURGH

Base per Lb.

Plates	2.85c.
Structural shapes	2.85c.
Soft steel bars and small shapes	2.60c.
Reinforcing steel bars	2.60c.
Cold-finished and screw stock—	
Rounds and hexagons	2.95c.
Squares and flats	3.45c.
Hoops and bands, under ¼ in.	2.95c.
Hot-rolled annealed sheets (No. 24), 25 or more bundles	3.15c.
Galv. sheets (No. 24), 25 or more bundles	3.65c.
Hot-rolled sheets (No. 10)	3.10c.
Galv. corrug. sheets (No. 28), per square (less than 3750 lb.)	$3.74
Spikes, large	2.50c.
Small	2.75c. to 2.90c.
Boat	3.00c.
Track bolts, all sizes, per 100 count	70 per cent off list
Machine bolts, 100 count	70 per cent off list
Carriage bolts, 100 count	70 per cent off list
Nuts, all styles, 100 count	70 per cent off list
Large rivets, base per 100 lb.	$3.00
Wire, black, soft ann'l'd, base per 100 lb.	2.75
Wire, galv. soft, base per 100 lb.	3.20
Common wire nails, per keg	2.35
Cement coated nails, per keg	2.35

On plates, structurals, bars, reinforcing bars, bands, hoops and blue annealed sheets, base applied to orders of 400 to 999 lb.

CHICAGO

Base per Lb.

Plates and structural shapes	3.00c.
Soft steel bars	2.75c.
Reinforc. bars, billet steel	1.35c. to 1.50c.
Rail steel reinforcement	1.15c. to 1.25c.
Cold-fin. steel bars and shafting—	
Rounds and hexagons	3.00c.
Flats and squares	3.50c.
Bands, ⅝ in. (in Nos. 10 and 12 gages)	2.95c.
Hoops (No. 14 gage and lighter)	3.50c.
Hot-rolled annealed sheets (No. 22)	3.55c.
Galv. sheets (No. 24)	4.10c.
Hot-rolled sheets (No. 10)	3.20c.
Spikes (⅜ in. and lighter)	3.45c.
Track bolts	4.30c.
Rivets, structural	3.75c.
Rivets, boiler	3.75c.
	Per Cent Off List
Machine bolts	70
Carriage bolts	70
Coach and lag screws	70
Hot-pressed nuts, sq., tap. or blank	70
Hot-pressed nuts, hex., tap. or blank	70
Hex. head cap screws	80
Cup point set screws	70 and 10
Flat head bright wood screws	52½
Spring cotters	60
Stove bolts	80
Rd. hd. tank rivets, 7/16 in. and smaller	65
Wrought washers	$4.50 off list
No. 8 black ann'l'd wire, per 100 lb.	$3.45
Com. wire nails, base per keg	2.30
Cement c't'd nails, base per keg	2.30

NEW YORK

Base per Lb.

Plates and struc. shapes	2.70c. to 3.10c.
Soft steel bars, small shapes	2.70c. to 3.10c.
Iron bars	3.24c.
Iron bars, Swed. charcoal	6.00c. to 6.50c.
Cold-fin. shafting and screw stock:	
Rounds and hexagons	3.39c.
Flats and squares	3.89c.
Cold-roll. strip, soft and quarter hard	4.95c.
Hoops	3.30c.
Bands	3.30c.
Hot-rolled sheets (No. 10)	3.00c. to 3.25c.
Hot-rolled ann'l'd sheets (No. 24*)	3.50c.
Galvanized sheets (No. 24*)	4.00c.
Long terne sheets (No. 24)	4.50c.
Standard tool steel	12.00c.
Wire, black annealed (No. 10)	3.60c.
Wire, galv. annealed (No. 10)	4.05c.
Tire steel, ½ x ½ in. and larger	3.40c.
Smooth finish, 1 to 2½ x ⅛ in. and larger	3.75c.
Open-hearth spring steel, bases	4.50c. to 7.00c.
Common wire nails, base, per keg	$2.60
	Per Cent
Machine bolts, cut thread:	Off List
¾ x 6 in. and smaller	65 to 65 and 10
1 x 30 in. and smaller	65 to 65 and 10
Carriage bolts, cut thread:	
½ x 6 in. and smaller	65 to 65 and 10
¾ x 30 in. and smaller	65 to 65 and 10
Boiler Tubes:	Per 100 Ft.
Lap welded, 2-in.	$18.05
Seamless welded, 2-in.	19.24
Charcoal iron, 2-in.	24.94
Charcoal iron, 4-in.	63.65

*No. 28 and lighter, 36 in. wide, 20c. higher per 100 lb.

ST. LOUIS

Base per Lb.

Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
Cold-fin. rounds, shafting, screw stock	3.35c.
Hot-rolled annealed sheets (No. 24)	3.80c.
Galv. sheets (No. 24)	4.35c.
Hot-rolled sheets (No. 10)	3.45c.
Black corrug. sheets (No. 24)	3.85c.
Galv. corrug. sheets	4.40c.
Structural rivets	4.00c.
Boiler rivets	4.00c.
	Per Cent Off List
Tank rivets, ⅞ in. and smaller, 100 lb. or more	65
Less than 100 lb.	60
Machine bolts	70
Carriage bolts	70
Lag screws	70
Hot-pressed nuts, sq., blank or tapped, 200 lb. or more	70
Less than 200 lb.	60
Hot-pressed nuts, hex., blank or tapped, 200 lb. or more	70
Less than 200 lb.	60

PHILADELPHIA

Base per Lb.

*Plates, ¼-in. and heavier	2.10c.
*Structural shapes	2.10c.
*Soft steel bars, small shapes, iron bars (except bands)	2.10c.
Reinforc. steel bars, sq., twisted and deform.	2.30c.
Cold-fin. steel, rounds and hex.	3.35c.
Cold-fin. steel, sq. and flats	3.85c.
*Steel hoops	2.65c.
*Steel bands, No. 12 to 3/16 in., incl.	2.50c.
Spring steel	5.00c.
Hot-rolled annealed sheets (No. 24)	2.55c.
Galvanized sheets (No. 24)	3.75c.
*Hot-rolled and annealed sheets (No. 10)	2.55c.
Diam. pat. floor plates, ¼ in.	5.00c.
Swedish iron bars	5.60c.

These prices are subject to quantity differentials except on reinforcing and Swedish iron bars.

*Base prices for 15,000-lb. orders; extra apply for smaller quantities.

CLEVELAND

Base per Lb.

Plates and struc. shapes	2.95c.
Soft steel bars	2.75c.
Reinforc. steel bars	1.75c. to 1.95c.
Cold-fin. rounds and hex.	2.95c.
Cold-fin. flats and sq.	3.45c.
Flat rolled steel under ¼ in.	3.00c.
Cold-finished strip	5.55c.
Hot-rolled annealed sheets (No. 24)	3.25c.
Galvanized sheets (No. 24)	3.75c.
Hot-rolled sheets (No. 10)	3.00c.
Black ann'l'd wire, per 100 lb.	$2.75
No. 9 galv. wire, per 100 lb.	3.20
Com. wire nails, base per keg	2.35

*Net base, including boxing and cutting to length.

CINCINNATI

Base per Lb.

Plates and struc. shapes	3.25c.
Bars, soft steel or iron	3.00c.
New billet reinforc. bars	3.00c.
Rails steel reinforc. bars	3.00c.
Hoops	3.90c.
Bands	3.20c.
Cold-fin. rounds and hex.	3.32c.
Squares and flats	3.82c.
Hot-rolled annealed sheets (No. 24)	3.75c.
Galv. sheets (No. 24)	4.25c.
Hot rolled sheets (No. 10)	3.30c.
Structural rivets	4.20c.
Small rivets	60 per cent off list
No. 9 ann'l'd wire, per 100 lb.	$3.00
Com. wire nails, base per keg (10 to 10 kegs)	2.65
Larger quantities	2.50
Cement c't'd nails, base 100-lb. keg	2.85
Chain, per 100 lb.	10.25
	Net per 100 Ft.
Seamless steel boiler tubes, 2-in.	$17.50
4-in.	36.00
Lap-welded steel boiler tubes, 2-in.	16.50
4-in.	34.50

BUFFALO

Base per Lb.

Plates and struc. shapes	3.20c.
Soft steel bars	2.95c.
Reinforcing bars	2.95c.
Cold-fin. flats and sq.	3.50c.
Rounds and hex.	3.00c.
Cold-rolled strip steel	5.25c.
Hot-rolled annealed sheets (No. 24)	3.70c.
Galv. sheets (No. 24)	4.05c.
Bands	3.30c.
Hoops	3.95c.
Hot-rolled sheets (No. 10)	3.45c.
Com. wire nails, base per keg	$2.60
Black wire, base per 100 lb.	3.25

BOSTON

Per Lb.

*Beams, channels, angles, tees, zees	3.00c.
*H beams and shapes	3.00c.
*Plates—sheared, tank, and univ. mill, ¼ in. thick and heavier	3.00c.
Floor plates, diamond pattern	5.25c.
*Bar and bar shapes (mild steel)	2.90c.
*Bands 3/16 in. thick and No. 12 ga. incl.	3.40c.
Hoops, No. 14 ga. and lighter	4.90c. to 5.40c.
*Half rounds, hf. ovals, ovals and bevels	4.15c.
Tire steel, rd. edge 1½ x ⅛ in. and larger	4.50c.
Smaller sizes	4.75c.
Cold-finished rounds and hexagons	3.60c.
Cold-rolled strip steel	5.20c.
Cold-finished squares and flats	4.10c.
*Blue annealed sheets No. 10 ga.	3.15c.
One pass cold-rolled sheets No. 24 ga.	3.50c.
Blued stove pipe sheets No. 24 ga.	3.90c.
Galvanized steel sheets No. 24 ga.	4.00c.
Lead coated (long ternes) No. 24 ga.	5.00c.

*Base prices for 15,000 lb. orders, extras apply for smaller quantities.

PACIFIC COAST

Base per Lb.

	San Francisco	Los Angeles	Seattle
Plates and struc. shapes, ¼-in. and heavier	3.15c.	3.30c.	3.00c.
Soft steel bars	3.15c.	3.30c.	3.00c.
Reinforcing bars	3.00c.	3.00c.	3.00c.
Hot-rolled annealed sheets (No. 24)	3.90c.	4.20c.	4.50c.
Hot-rolled sheets (No. 10)	3.25c.	3.50c.	4.00c.
Galv. sheets (No. 24)	4.55c.	4.50c.	5.00c.
*Structural rivets, ⅞ in. and larger, less than 1000 lbs.	5.75c.	5.00c.	4.00c.
*Cold-finished steel			
Rounds	5.50c.	5.50c.	4.50c.
Squares and hexagons	6.75c.	6.75c.	5.75c.
Flats	7.25c.	7.25c.	6.75c.
Common wire nails, base per keg in less carloads	$2.90	$2.90	$3.00

*Subject to deductions for quantity. On remainder of schedule 10-ton minimum carload differential 25c. per 100 lb. Plates, shapes, bar bands and hot-rolled sheets, No. 16 gage and heavier, subject to advance of 50c. per 100 lb. on orders under 200 lb.

PLANT EXPANSION AND EQUIPMENT BUYING

Machine Tool Buying Is Not Gaining

Interest in Production Equipment That Will Assure Lower Costs Is Spreading, However

ALTHOUGH many manufacturers are taking more interest in their ultimate machine tool requirements, this interest largely takes the form of obtaining figures on production equipment that will lower costs, and has not resulted in many orders.

The substitution of more efficient machine tools will eventually take place on a large scale, but it will require greater improvement in the demand for the products the machines make than has yet developed to bring about this replacement program in industry generally.

In some sections the demand for used tools has increased. Machine tool dealers say that in previous periods of depression the sales of second-hand tools gained before that of new tools, so they regard the present interest in used tools as a good indication.

Local committees of the National Committee on Industrial Rehabilitation are being formed throughout the country, and they will soon be at work on the program of reequipping manufacturing plants.

NORTH ATLANTIC

Servel Sales, Inc., 51 East Forty-second Street, New York, affiliated with Servel, Inc., Evansville, Ind., manufacturer of electric and gas refrigerators, has leased six-story building, 50 x 100 ft., at 534-38 West Fifty-eighth Street, for refrigerator service and repair unit.

Superintendent of Lighthouses, Staten Island, N. Y., plans early purchase of seven steel buoy bodies, with accumulators, lanterns, etc., for New York and New Jersey waters.

Indirect Lighting & Products Corpn., New York, has been organized by Aaron D. Kaufman, 2181 Wallace Avenue and Benjamin Kaufman, 2045 Holland Avenue, both Bronx, to manufacture lighting equipment and other electrical devices.

Pennsylvania Lubricating Co., 26 Broadway, New York, manufacturer of lubricating oils and other petroleum products, with main plant at Pittsburgh, has arranged for increase in capital from $500,000 to $2,000,000 for expansion. Company is affiliated with Standard Oil Co. of New Jersey.

International Aluminum Foundry Co., Inc., New York, has been organized by Ludwig Strietzel, 1702 Grand Avenue, Bronx, and associates, to take over company of same name at 414 East Twenty-third Street.

Central Railroad of New Jersey, 143 Liberty Street, New York, has reopened shops at Elizabethport, N. J., following shut down for about four months, reinstating about 200 men. Company is also increasing operations at repair shops at Ashley, Pa., recalling a number of men. It is proposed to operate both plants on five-day week basis.

Common Council, Briarcliff, N. Y., plans installation of steel tanks with capacity of about 4,000,000 gal. for water supply system. H. B. Valentine, Briarcliff, is engineer.

Joltcrete, Inc., Yonkers, N. Y., has been organized by M. L. Rachlin, 241 Henry Street, New York, and associates, to manufacture machinery for production of building blocks.

Superior Air Products Co., 132 Malvern Street, Newark, manufacturer of commercial oxygen products, is erecting one-story addition. Cost over $20,000 with equipment.

Clinton Water Supply Co., Clinton, N. J., plans installation of purification machinery for service at Clinton, Lebanon and Annandale, ordered by State.

Thatcher Co., 39 St. Francis Street, Newark, has increased production at local stove works and has also advanced output at branch plant at Garwood, N. J., for boilers and radiators, adding to working forces at both places.

Koenig & Schoner, Inc., Irvington, N. J., has been organized by John Koenig and William E. Schoner, 105 Montrose Street, Newark, to manufacture metal products. Plant will be operated at Irvington.

Keystone Lubricating Co., Twenty-first and Clearfield Streets, Philadelphia, manufacturer of lubricating oils, etc., plans rebuilding part of plant recently damaged by fire. Loss over $175,000 with equipment.

S. & W. Casting Co., Newark, N. J., recently organized, has leased building at 62 Ferguson Street for manufacture of brass, bronze and aluminum castings.

Charles Ahr, who recently organized a company to manufacture light drop forgings and do machine work, has leased a two-story building on Lincoln Boulevard, Middlesex Borough. Mr. Ahr was formerly head of Charles Ahr Co., Inc., Lincoln, N. J., which recently discontinued business.

National Harris Wire Co., 221 Verona Avenue, Newark, N. J., recently in receivership, has been purchased by George W. Prentiss Co., Holyoke, Mass.

SOUTH ATLANTIC

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Oct. 19 for 3000 kw. turbo-alternator and accessories for Puget Sound, Wash., Navy Yard, and one 1500 kw. turbo-alternator and accessories for Boston Navy Yard (Specification 7022); until Nov. 2 for electrical distribution system in engine and aircraft overhaul shop, Pearl Harbor, T. H. (Specification 7024).

Precision Gear & Machine Co., Gastonia, N. C., has acquired factory building at 115-21 West Eighth Street, Charlotte, N. C. Present works will be removed to new location and additional machinery installed for increased output.

Pure Oil Co., Beckley, W. Va., with headquarters at 35 East Wacker Drive, Chicago, plans bulk oil storage and distributing plant at Morgantown, W. Va., for initial capacity of 80,000 gal.

Purchasing and Contracting Officer, Holabird Quartermaster Depot, Baltimore, asks bids until Oct. 26 for quantity of automobile parts (Circular 24).

Constructing Quartermaster, Bolling Field, Washington, asks bids until Oct. 26 for 5-ton natural draft incinerator plant, with can-washing equipment.

William Hollingsworth Machine Co., Baltimore, has been organized to take over and expand machine works at 227 North Holliday Street, heretofore operated under name of William Hollingsworth, who will head new organization.

City Council, Fayetteville, N. C., is considering erection of a municipal electric light and power plant. Cost over $50,000 with equipment. Survey has been made by Olsen & Johnson, 5 Exchange Place, Raleigh, N. C., engineers.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 18 for one power-feed, gang ripsaw (Schedule 8841), one knife grinder (Schedule 8864), one hobbing machine (Schedule 8840), one upsetting and forging machine (Schedule 8842), all motor driven, for Norfolk, Va., Navy Yard; one milling machine and attachments (Schedule 8824), for Eastern and Western yards; one cut-off saw (Schedule 8867), for Philadelphia Navy Yard; two turret lathes (Schedule 8861), all motor-driven, for Brooklyn Navy Yard; until Oct. 25, one motor-driven turret lathe (Schedule 8836), water meters (Schedule 8846), 48 work benches, 10 shop foremen's desks, nine mechanics' hanging tool cabinets, etc. (Schedule 8874), brass and steel nuts and bolts (Schedule 8827), steel bolts and nuts, and lag screws (Schedule 8826) for Eastern and Western navy yards; steel forgings (Schedule 8854) for Boston, Brooklyn and Puget Sound navy yards; naval brass forgings (Schedule 8851) for Newport, R. I., Navy Yard; until Oct. 18, 6000 lb. steel forgings (Schedule 8802) for Washington Navy Yard.

CENTRAL DISTRICT

Continental Refining Co., Oil City, Pa., has awarded general contract to Bouquin Co., Oil City, for extensions and improvements in oil refinery, including new steam power house. Cost about $30,000 with equipment.

B. & D. Mfg. Co., Pittsburgh, has been organized by Harold W. Buchman, Ben Avon, Pa., to manufacture valves and kindred engineering specialties.

Pittsburgh Plate Glass Co., Grant Building, Pittsburgh, has authorized fund of $350,000 for improvements and maintenance work at plant at Creighton, Pa. Plant, which has just been reopened, following curtailment for several weeks, recalling about 1000 workers.

Lockhart Iron & Steel Co., McKees Rocks, Pa., has advanced production schedule at four local mills, recalling about 400 men.

Baltimore & Ohio Railroad Co., Pittsburgh, has increased operations at repair shops at DuBois, Pa., recalling about 400 men, making a working force now of 600 operatives.

Warren Tool & Forge Co., Warren, Ohio, has been acquired at a receiver's sale by group of bondholders, headed by R. E. Gibson, for price of $75,000. Plans are under way for reorganization of company and resumption of operations. Mr. Gibson will be treasurer; C. L. Schoonover, manager, and Howard C. Mull, sales manager.

Adams Bag Co., Chagrin Falls, Ohio, manufacturer of heavy paper bags and containers, has awarded general contract to H. K. Ferguson Co., Hanna Building, Cleveland, for one-story addition, 61 x 140 ft., for storage and distribution. Cost about $40,000 with equipment. Installation will include two cranes and other handling equipment.

Retread Tire & Rubber Co., Akron, Ohio, care of Sheck & Stevens, 430 Second National Bank Building, has been organized by C. T.

ILLINOIS FLOOR PLATE

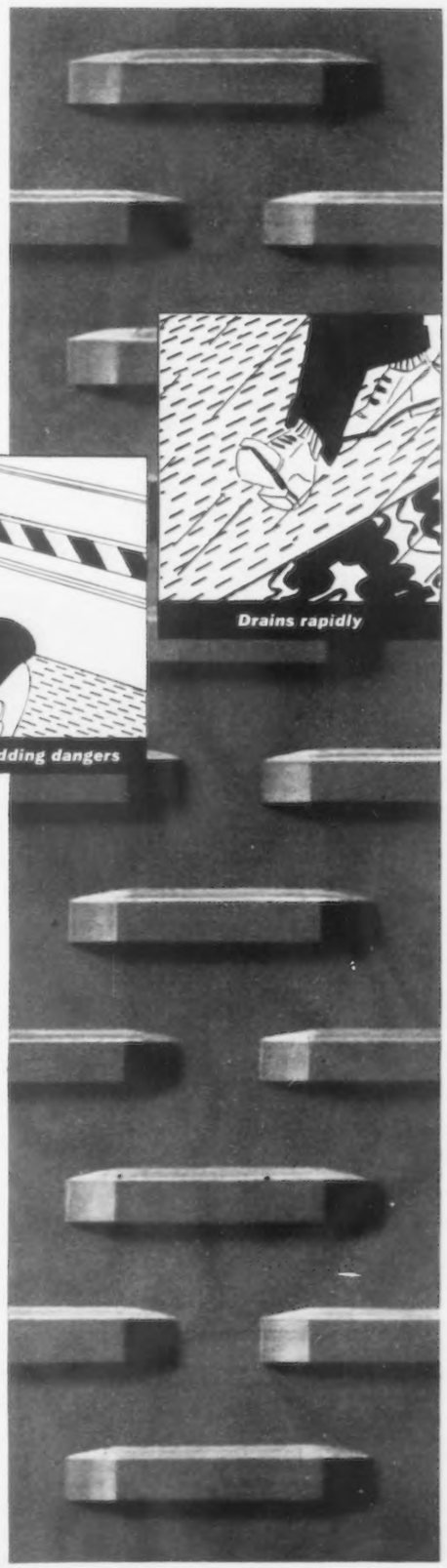
It's easy to walk on

Makes every step sure-footed

Cleans easily from any direction

Reduces skidding dangers

Drains rapidly



Illinois Floor Plate is furnished in the following dimensions:

THICKNESS—3/16″ to 3/4″, exclusive of raised figure.
WIDTHS—6″ to 84″.
LENGTHS—On widths from 6″ to 15″, 120″ maximum.
On widths from 16″ to 29″, 240″ maximum.
On widths 30″ or above, 480″ maximum.
WEIGHTS—8.8 to 31.7 pounds per square foot.

Illinois Steel Company
SUBSIDIARY OF UNITED STATES STEEL CORPORATION
208 So. La Salle St., Chicago, Illinois

U·S STEEL

Pflueger, Jr., and associates, to manufacture automobile tires and other rubber products.

State Office Building Commission, State House, Columbus, Ohio, F. W. Mowrey, executive secretary, asks bids until Oct. 24 for electric and steam transmission lines from State Office Building to State Capitol Building. Harry Hake, 2400 Gilbert Avenue, Cincinnati, is architect.

Borden Co., Youngstown, Ohio, manufacturer of pipe-threading and cutting tools, has increased production schedule.

Contracting Officer, Material Division, Wrigh Field, Dayton, Ohio, asks bids until Oct. 17 for 10 fuel pump drive assemblies and 10 fuel pump drive coupling assemblies (Circular 142); until Oct. 18 for parking brake pawl throwout springs and spring fittings, brake control handle stops, landing gear filler plugs, etc. (Circular 146); until Oct. 19, 2000 battery-testing hydrometers (Circular 145); until Oct. 24, 200 fuel pump flexible shaft assemblies (Circular 140); until Oct. 25, 80,000 hose clamps and 32,000 tube clamps (Circular 139), 200 tow target assemblies (Circular 143); until Oct. 26, about 1000 tie rods (Circular 149), 854 reworking type fuel pumps, a.c. (Circular 151).

Youngstown Sheet & Tube Co., Youngstown, Ohio, has authorized immediate rebuilding of steel conduit plant unit at Struthers, Ohio, recently destroyed by fire. Loss about $50,000 with equipment.

Cleveland, Cincinnati, Chicago & St. Louis Railroad Co., Cincinnati, has resumed operations at shops at Beech Grove, Ind., following curtailment since middle of July, recalling more than 1600 men.

F. L. Atwood and Leonard Van Dyke, Madison, Ind., have organized company to manufacture special type of gasoline engine spark plugs. Property has been secured for initial production of about 10,000 spark plug units daily.

Thompson Mfg. Co., Indianapolis, care of Edward W. Hohlt, Consolidated Building, has been organized by Lloyd W. Thompson and associates, to manufacture metal kitchen cabinets, utensils, etc.

Sealed Power Corpn., Muskegon, Mich., formerly known as Piston Ring Co., has developed new line of pistons, pins and cylinder sleeves, and will carry out large commercial production. Plant is now employing about 750 workers.

Adrian Automotive Co., Adrian, Mich., recently organized to manufacture automobile parts, screw machine products, etc., is occupying former factory of A. G. Matthes Co. Roy G. Ferry is one of heads of new company.

Frederick Colman & Sons, 7250 Central Avenue, Detroit, manufacturers of tools, dies, etc., have awarded general contract to H. C. Wright Building Co., 12709 Lynden Street, for one-story addition. Cost over $25,000 with equipment.

SOUTHWEST

City Council, Washington, Mo., has plans for a municipal electric light and power-house; cost close to $100,000 with equipment. Burns & McDonnell Engineering Co., Interstate Building, Kansas City, Mo., is consulting engineer. F. J. Ruether, mayor, at head of project.

Veterans' Administration, Construction Service, Washington, asks bids until Oct. 25 for new water softening plant at institution at Leavenworth, Kan.

New Mexico Potash & Chemical Co., Carlsbad, N. M., is developing potash properties near Carlsbad, and plans installation of mining and other equipment.

County Urban Water Co., 114 West Tenth Street, Kansas City, Mo., will ask bids soon for two elevated steel tanks and towers, 150,000-gal. capacity, and about 35 miles of 4- to 12-in. cast iron water pipe in connection with expansion in water system for several townships; electric-operated and gas engine-operated pumping plants will be installed. Henrici-Lowry Engineering Co., address noted, is engineer.

Standard Bauxite & Chemical Co., Benton, Ark., is erecting new mill and plans to have unit ready for service by first of year. Cost close to $80,000 with machinery. W. E. Thompson is superintendent.

Gladewater Refining Co., Gladewater, Tex., plans rebuilding part of oil refinery recently damaged by fire. Loss about $50,000 with machinery.

Texas Mohair & Woolen Mills, Inc., New Braunfels, Tex., recently organized by James McDowell and Bailey Jones, New Braunfels, plans installation of power plant in connection with new scouring mill. Cost over $50,000 with equipment.

El Oro Gold Mine, Las Animas, Sierra County, N. M., operated by Charles J. Hutchinson, care of Securities Service Corpn., Dallas, Tex., and associates, has authorized new mill at mining properties. Cost over $50,000 with machinery. Company has been formed and will operate with capital of $250,000.

NEW ENGLAND

Lee Marble Co., Lee, Mass., has awarded general contract to Bethlehem Fabricators, Inc., Bethlehem, Pa., for rebuilding one-story cutting, polishing and finishing mill, 118 x 200 ft., recently damaged by fire. Cost over $40,000 with equipment. Leo F. Caproni & Co., 50 Hubinger Street, New Haven, Conn., are architects.

Boston & Maine Railroad Co., Boston, has adopted 48-hr. weekly schedule at car repair shops at Billerica, Mass., with employment of about 500 workers, replacing a stagger system operative for several months giving men about 11 days employment each month.

Ducharme Machine & Foundry Corpn., Medford, Mass., has been organized by George A. Ducharme, 6 Locust Street, and associates, to operate a machine shop and foundry, manufacture special machinery and parts.

United States Rubber Co., Providence, R. I., has adopted capacity schedule at local mill, giving employment to full working force on three eight-hour shifts a day.

Waterbury Fastener Corpn., Waterbury, Conn., manufacturer of snap fasteners, metal frames and other metal specialties, has arranged for merger with Frank J. Quigan, Inc., 65 Roelding Street, Brooklyn, N. Y., manufacturer of similar products. Both plants will be continued in operation and Quigan company will retain present name.

General Electric Co., Pittsfield, Mass., is advancing production in oil furnace manufacturing division plant by about 50 per cent, with increased working quotas.

MIDDLE WEST

City Council, Morris, Ill., has plans for new pumping plant for municipal water system. Cost over $30,000 with machinery. H. A. Tollberg, City Hall, Ottawa, Ill., is engineer.

Essco Mfg. Co., 111 Harrison Street, Peoria, Ill., has been organized by Loren M. Comber and Edward Kett, capital $40,000, to operate a local foundry and machine works.

Miehle Printing Press & Mfg. Co., West Fourteenth Street and South Damen Avenue, Chicago, has increased production schedule, reinstating about 100 men.

Minnesota Mining & Mfg. Co., 791 Forest Street, St. Paul, Minn., manufacturer of abrasive products, will take bids soon on general contract for two-story top addition to buildings Nos. 2 and 3, 46 x 152 ft. Cost over $40,000 with equipment. Toltz, King & Day, Inc., Builders' Exchange Building, is architect and engineer.

Board of Trustees, Colorado State Teachers' College, Greeley, Colo., let general contract to Woehler & Force, 822 Seventh Street, for power plant for central heating service, to include two 200-hp. boilers, one 180-hp. boiler and accessories, coal pulverizing equipment, etc. Cost $83,982. Prouty Brothers Engineering Co., Exchange Building, Denver, is engineer.

City Council, Thief River Falls, Minn., is considering installation of additional equipment in municipal power plant, including 750-hp. Diesel engine unit and accessories. P. A. Pederson is city clerk.

Grigsby-Grunow Co., 5801 Dickens Avenue, Chicago, manufacturer of radio equipment and sets, is increasing production schedule, advancing working quota from 2000 to 2600 employees.

General Armature Corpn., 1526 South Wabash Avenue, Chicago, has been organized by R. Karton and Abner Sideman, to manufacture electrical appliances and devices.

Chieftain Batteries Co., 2226 West Broadway, Council Bluffs, Iowa, manufacturer of electric storage batteries, has purchased site at Hastings, Neb., for one-story plant.

Valley Forge Steel & Tool Co., 100 South Jefferson Street, Chicago, has arranged for increase in capital from $105,000 to $200,000, for increased operations.

SOUTH CENTRAL

Three Rivers Oil Corpn., Paducah, Ky., Richard Gordon, president, plans bulk oil storage and distributing plant on 9-acre tract, foot of Myers Street. Cost over $50,000 with equipment.

Southern Belting & Supply Co., Knoxville, Tenn., has been organized to manufacture mechanical belting and kindred products. New company will take over and expand plant of Reed & Morrison Belting Co., 923 North Central Avenue.

E. D. Loch, manager, Southern United Ice Co., McComb, Miss., is at head of project to establish meat-packing plant. It is proposed to organize a company to carry out project.

Southern Pacific Railroad Co., New Orleans, is planning erection of produce terminal on waterfront, with refrigerating and cold storage facilities, conveying and loading equipment, power department, etc. Cost over $600,000 with equipment.

PACIFIC COAST

Bureau of Yards and Docks, Navy Department, Washington, asks bids until Nov. 2 for 85 steel tanks for storage of helium gas under high pressure, including helium piping and complete accessories at Naval Air Station, Sunnyvale, Cal. (Specification 6964).

Haymon Krupp & Co., Duncan, Ariz., operating White Rock mine, about three miles from city, plan new mill for copper ore service. Cost about $35,000 with equipment. Dell Potter, Jr., heads company.

Master Machinery Corpn., Los Angeles, care of Hibbard & Kleindienst, 409 Kerckhoff Building, recently organized by Daniel McDonald and H. S. Jordan, capital $75,000, plans operation of local plant for manufacture of machinery and parts.

Board of City Trustees, Hayward, Cal., plans installation of pumping machinery in connection with extensions and improvements in municipal waterworks.

General Petroleum Corpn., 108 West Second Street, Los Angeles, plans installation of battery of steel tanks in connection with addition to oil refinery at Torrance, Cal., with piping, pumping machinery and auxiliary power equipment. Cost over $1,000,000. Fred Isaacs, manager, refining division of company, 2525 East Thirty-seventh Street, will be in charge of project.

Bureau of Supplies and Accounts, Navy Department, Washington, asks bids until Oct. 18 for one motor-driven universal armature machine with attachments (Schedule 8817), 57,300 lb. plate steel (Schedule 8805), 16,500 lb. sheet steel (Schedule 8803), and quantity of corrosion-resisting steel (Schedule 8847) for Puget Sound Navy Yard; until Oct. 25, nine steel towers, six steel sections and 18 steel tower heads (Schedule 8835), four self-supporting extension ladders (Schedule 8834), four steel motor overhaul stands (Schedule 8873) for Mountain View, Cal., Naval Station; 800,000 lb. plate steel (Schedule 8857), 50,700 lb. sheet steel (Schedule 8856), 13,600 lb. brass angles (Schedule 8858) for Mare Island Navy Yard; and two motor-driven turret lathes (Schedule 8844) for Puget Sound Navy Yard.

Oxnard Citrus Association, Hueneme, Cal., William Ross, general manager, has plans for one-story addition to packing plant, 110 x 150 ft. Cost about $45,000 with equipment. Adolph Schroeder, 300 G Street, Oxnard, Cal., is in charge of construction.

FOREIGN

Government of Brazil, Rio de Janeiro, has placed order with Waco Aircraft Co., Troy, Ohio, for 20 airplanes costing about $250,000. Waco company will advance production schedule immediately, reinstating large number of employees.

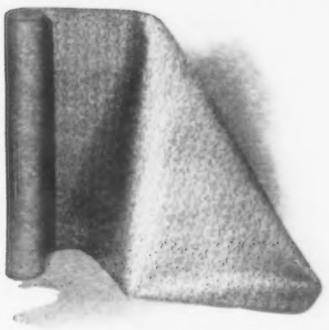
Consolidated Oil Corpn., 45 Nassau Street, New York, is concluding negotiations for purchase of controlling interest in Penn-Mex Fuel Co., operating oil properties at Tuxpam, Mexico, heretofore held by South Penn Oil Corpn., Chamber of Commerce Building, Pittsburgh. Purchasing company has a refinery in Mexico and will use acquired property for a producing unit, installing additional oil well equipment, pipe lines, etc.

Water Department, Singapore, Straits Settlement, Federated Malay States, asks bids until Nov. 7 for malleable iron fittings and special fittings for pipe lines.

Announcing...

GARLOCK 660

—AN ENTIRELY NEW SHEET PACKING FOR GASOLINE, OIL and WATER



Patent Applied For

TO provide a superior gasketing material for gasoline, oil or water joints, or for any other service on which cork or treated paper sheet has been used, Garlock Six-Sixty was developed.

This material is manufactured by a new process which combines granulated cork with tough paper fiber into a strong, resilient sheet packing having the desirable qualities of both cork and paper. It is not brittle; it will not shrink, crack nor curl; it cuts clean and easily. It is different from any sheet packing heretofore produced. You will like it!

Garlock Six-Sixty is made in all regular thicknesses from .010" to 1-2"— Sheets or rolls are 36" wide.

Place a trial order for Garlock Six-Sixty today — or, if you prefer, drop us a note and a Garlock representative will supply you with samples and complete information.

THE GARLOCK PACKING COMPANY
Palmyra, N. Y.

In Canada:
The Garlock Packing Company of Canada, Limited
Montreal, Quebec

Technique of Size Control in Precision Grinding

(*Continued from Page 571*)

lathes, milling machines and gear cutters will boost the cost of items produced on these machines beyond the economic limit.

Here again there is necessity for good judgment and production balance on the part of the production engineering department and the designing engineers. It is unfortunate that some designing engineers are not accurately informed regarding the accuracy and producing possibilities of modern machine tools, hence the frequent assignment of limits which, if adhered to, would inflate the costs.

Generally speaking, engineers can be hired capable of designing mechanisms which will perform any reasonable function under almost any condition, but the real engineer is the man who can design equipment which will achieve the desired results, with the minimum number of parts, made to maximum tolerances.

Accuracy, a Building Up Process

With the advent of the centerless grinder in the cylindrical grinding field, a new technique as regards sizing as a part of mass production programs has grown up.

Take the automobile wrist pin, an article ranging up to 1 in. in diameter by approximately 3 in. long, and produced to limits of accuracy of plus 0 minus 0.0002 in. The process by which the extreme accuracy of this component is built up is illustrated in Fig. 3. Note the gradual decrease in the inaccuracies of the work. Concurrent with this is the building up of the finish until the work has reached its nominal size within a prescribed tolerance and the results obtained are so uniform that inspection is greatly simplified and the hazard of rejection almost eliminated.

The deviation from the true axis or the true plane of motion in a precision machine cannot exceed the limits of accuracy in the work which it is expected to produce. It is obviously illogical to expect a machine produced to limits of accuracy of 0.0005 in. to produce work to an accuracy of two or three-tenths of a thousand, but, strange as it may seem, such demands are sometimes made on machine tools.

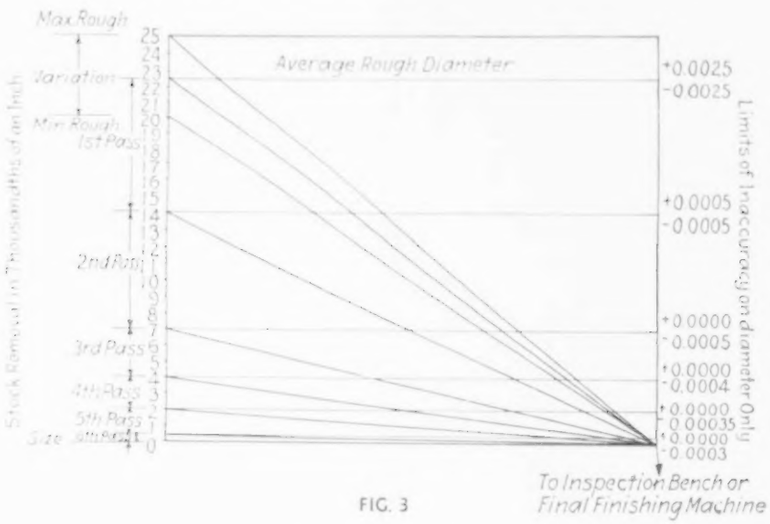


FIG. 3

During recent years the increase in horsepower applied to grinding wheels has provided many new problems for the designer. It is not unusual for motors of 60 hp. to be applied to grinding wheel spindles, and even those motors are quite frequently overloaded. Considerable thought and imagination are necessary to insure that, when inevitable distortion takes place, that its effects are minimized. In other words, rather than have the grinding wheel dig into the work and make it undersize, it is far better to have it spring away from the work and leave the work oversize.

With the increased use of the high production infeed type centerless grinding machine, wherein the cut is not permitted to die out, and the piece of work is submitted to grinding action for a prescribed period of time, it is absolutely necessary that distortion in the machine elements be kept down to a minimum and that, if and when, it does take place its effects will be to leave the work large rather than small.

With a grinding wheel weighing several hundred pounds and up to 36 in. in diameter, revolving with a peripheral speed of from 6500 to 7000 feet per minute, and with work rotating up to 120 feet per minute, the problem of natural frequency of vibration is a very real one. Especially where, as is sometimes the case, these frequencies develop into harmonics and they in turn manifest themselves as chatter marks on the work. The wise designer is always on the lookout for possible harmonic combinations and tries to so arrange his components that their frequencies are not liable to synchronize.

The biggest bugbear which has still to be overcome in grinding machine operations is the provision of adequate dynamic balancing for the high speed rotating members. Ultimately it is to be expected that an automatic dynamic balancing of the grinding wheel spindle assembly will be possible, but until this mechanism is made available, it will always be necessary for the operator to watch the grinding wheel action, and whenever necessary arrange the balancing slugs in such a way that vibration due to unbalance is kept at a minimum.

Backlash and all its attendant evils is responsible for many of the difficulties in securing accurate size control. Modern designs recognize that backlash is inevitable, and therefore mechanisms are so arranged that backlash is kept in one direction.

With the fine limits of accuracy to which component parts are now produced, the thickness of oil film at various temperatures has become a very real problem and has led to some ingenious developments in the way of preloading, all designed with the idea of cutting out the effect of the variable film thickness of the lubricating oil. The magnitude of the problem will be realized when it is known that the film between the spindle and bearings of many modern precision grinding machines is often in excess of the total tolerance on the work being produced.

Temperature distribution in the machine becomes of increasing importance as the limits or tolerances on the work become finer. Temperature change is a disconcerting variable which can cause endless trouble and its effects should be so directed and controlled that they exercise the minimum effect on the finished work. It is because of this factor that we have to use a copious supply of coolant in all high production grinding operations, but it should be borne in mind that, while the coolant will transfer the heat from the work to the coolant, it passes from there into the body of the machine or the coolant tank, and must be so controlled from this point onward that its effects are not felt in the alinement of the machine.

There is a responsibility on the designer to provide facilities on the machine for the operator to attack the work in such a way that distortions in the machine, distortions in the work

(*Continued on Advertising Page 18*)

From SOURCE TO SERVICE *guarding* *Quality* ALL THE WAY

AMERICAN

STEEL SHEETS for EVERY PURPOSE

From the iron mine to the finished product, each operation and process is surrounded with the close attention to detail that is so essential in maintaining high quality standards.

The ore beds, coal workings, limestone quarries from which raw materials are obtained—the railroads and ship lines by which these materials are transported—the refining operations where the various ingredients are blended into steel—the rolling and finishing equipment from which AMERICAN Black and Galvanized Sheets, Tin and Terne Plates finally emerge with their distinctive mark and character: all these factors and elements are organized under one control, with one purpose in view, to keep faith with the multiplied users of steel sheets and tin plates who expect the best, and specify AMERICAN quality products.

U S STEEL

American Sheet and Tin Plate Company

GENERAL OFFICES: Frick Building, PITTSBURGH, PA.

SUBSIDIARY OF UNITED STATES STEEL CORPORATION

KEYSTONE AMERICAN

PRINCIPAL SUBSIDIARY MANUFACTURING COMPANIES:

AMERICAN BRIDGE COMPANY
AMERICAN SHEET AND TIN PLATE COMPANY
AMERICAN STEEL & WIRE COMPANY
CARNEGIE STEEL COMPANY
COLUMBIA STEEL COMPANY
CYCLONE FENCE COMPANY
FEDERAL SHIPBUILDING AND DRY DOCK COMPANY
ILLINOIS STEEL COMPANY
NATIONAL TUBE COMPANY
OIL WELL SUPPLY COMPANY
THE LORAIN STEEL COMPANY
TENNESSEE COAL, IRON & R.R. COMPANY
UNIVERSAL ATLAS CEMENT COMPANY

Pacific Coast Distributors—Columbia Steel Company, San Francisco, Calif.
Export Distributors—United States Steel Products Company, New York, N. Y.

and deviations from the true plane, due to stresses set up by the cutting action, will exercise a minimum accuracy effect. It was the consideration of these factors which resulted in the universal acceptance of the economic worth of the vertical spindle type surface grinding machine and the conventional type of boring mill and vertical lathe.

The known tendency of a grinding wheel on a precision grinding machine to ride the work has added indirectly to the success of the centerless method of grinding, just as the free cutting qualities involving a reduction in contact pressure between the wheel and work of the cup wheel method of surface grinding has rightly added to the economic attractiveness of this particular method of removing metal.

While it will be readily admitted by all designers and users that a certain amount of wear is unavoidable, there is a united opinion in favor of the arrangement of the wearing elements in such a way that change in size and shape will not affect the final accuracy producing qualities of the machine. Where it is found necessary to provide means for compensation for unavoidable wear, care should be taken by the designer to insure that when such adjustments are made they contribute to rather than detract from the basic accuracy of the machine.

Aging of Units Affects Alinements

In some cases the effects of aging can be obtained in an accelerated way by hammering, tumbling, normalizing and seasoning in the open air. While many short cuts have been devised, the fact remains that no matter what the design may be, castings will invariably change shape, and this change in shape must be compensated for by an adjustment built into the foundation or the machine itself. Particularly is this the case in those machine tools where the beds are long in proportion to their width and height, and the machine which lacks the facilities for correction of alinement due to aging will, in course of time, only be capable of producing work within the wider tolerances.

In the endeavor to produce work with a variation from the nominal size not in excess of two ten thousandths of an inch with a cutting tool carried on a spindle, this spindle having at least five ten thousandths of clearance between its outer diameter and the supporting bearing, many special problems are encountered. In the first place, the spindle is floated on an oil film which in itself is quite elastic, even though the load carrying capacity of the oil film under certain conditions may be exceedingly high. However, this oil film varies in its load carrying capacity partly according to its viscosity, and its viscosity in turn is controlled by temperature, and the temperature in turn is controlled by the highly variable factor of the grinding load.

It is essential that every effort be made in the operation of the precision grinding machine to insure that the load applied to the oil film be kept as consistent, both as regards intensity and periodicity, as possible. The same conditions apply to the work rotating and supporting elements. As in these we have to contend with lubricated surfaces and a number of joints, all of which presumably carry their quota of oil film.

Referring to Fig. 3, in which is made a graphical presentation of the number of passes, the stock reduction and the gradually increasing accuracy of the piece, it will be readily understood how the provision of a hopper feed to a through feed centerless grinding machine will materially improve the accuracy of the product, inasmuch as by feeding wrist pins continuously between the grinding and regulating wheels, the pressure tending to open the throat of the machine is maintained at a constant figure, the variation in this pressure being directly proportional to the extent of the tolerance on nominal size permissible in each pass.

An accurate sizing mechanism composed of such elements as cast iron, steel and lubricating oil is very sensitive to outside influences, and for this reason the selection of the site for a precision grinding machine should be given just as careful consideration as the actual design of the machine itself. The most commonly encountered outside influence adversely affecting the performance of the tool is vibration, and for this reason care should be taken to locate the machine in such a way that vibrations from other machinery are not transmitted to it. Likewise, the location should be selected after due consideration to temperature changes and freedom from dirt.

While the main items of consideration in this article so far have been in reference to size control as affected by work conditions and machine characteristics, the fact should not be lost sight of that all operations to be economically attractive must be performed within a certain time limit.

In the time allocated to one complete cycle of operation we have two elements, the actual machining time and the idle or preparatory and unloading time. The former is productive and the latter unproductive. This latter item of unproductive or idle time has been attacked from many angles, particularly by the provision of automatic mechanisms which are not subject to the influence of fatigue, etc. If purely economic factors alone had to be considered, then it is obvious that automatic machinery would give us the cheapest and most accurate results. However, this ecenomic ideal is unattainable and always will be so.

High production requirements have tended during recent years to bring the dead stop mechanism method of sizing somewhat into disfavor. When traversing a unit of the machine, particularly a precision grinding machine up to a dead stop, the inference is that when securing the size, all spring in the slides and operating mechanism will be gradually dissipated until the cutting element eventually clears itself of the work. This is obviously a lengthy procedure, and while undoubtedly the dying out cut, or, in other words, the sparking out of the grinding wheel method of sizing, will continue to be used, it has ceased to be economically attractive where work must be produced in mass production quantities.

Even with the increased use of hydraulic mechanisms there is a growing tendency not to permit the grinding wheel to spark out, but by controlling the pressure of contact between the wheel and work to secure uniformity of size within the prescribed limits. The saving in time is enormous. Consider, for example, the problem of sizing the diameter of the stem on an automobile poppet valve. Handling this job on the center type grinder, where the cut must be allowed to spark out, production is something less than 1 valve per minute, whereas from 20 to 30 valves per minute can be produced on the centerless grinder with precisely the same dimensions and limits of accuracy on the work.

No better example of lack of control over the sizing operation can be provided than in the operation of the older type of internal grinding machine not provided with automatic sizing facilities. With these machines the operator frequently took more time to gage the work than he needed to actually grind it. It was not until the introduction of the internal grinding machine with automatic sizing facilities that really high production methods became applicable to this class of grinding.

The three main types of automatic sizing mechanisms on the machines on the market today all have their special merits, and it is significant that the latest to be released does not entail the use of a dead stop mechanism. In this case, the cut is finished in the air and by means of a light electrical contact alongside the grinding wheel, a circuit is closed which withdraws the wheel from the work.

The introduction of hydraulics has provided the machine tool manufacturer with a wonderfully sensitive means of controlling the approach to size zero, and the fullest advantage is being taken of this system where it is economically applicable.

Automatic compensation for the natural wear of the grinding wheel has long been a question confronting the designer of precision grinding equipment, but it was not until the introduction of automatic sizing equipment

(*Concluded on Advertising Page* 20)

Wire viewed from every angle

Dictionary definition:

Wire, n. A slender rod, strand or thread of ductile metal, usually formed by drawing through dies or holes.

Certainly not the definition that anyone using wire should give. Every manufacturer working wire has requirements, a viewpoint peculiar to his particular product and operation. There is one and only one *best* wire for him. Sometimes he uses it but ofttimes he manufactures as well as he can accepting losses and delays as the natural, unavoidable conditions of his lot in life.

Wissco Engineers have remedied this condition wherever they have found it. They will recommend a kind of Wissco Wire that, because of its characteristics and uniformity, permits the lowest possible manufacturing costs. Wickwire Spencer Steel Company is a dependable source of wire supply. Its products are always true to grade and uniform.

The diagnostic services of Wissco Engineers are yours for the asking. They will gladly view wire from your angle.

•

Wickwire Spencer Steel Company, 41 East 42nd Street, New York City; Buffalo, Chicago, Detroit, Philadelphia, Tulsa, Worcester; Pacific Coast Headquarters: San Francisco; Warehouses: Los Angeles, Portland, Seattle. Export Sales Department: New York City

WISSCO WIRE
by Wickwire Spencer

Wickwire Spencer manufactures High and Low Carbon Wires—in various tempers, grades and finishes—for your specific purpose. Hard-Drawn, soft, or annealed Basic or Bessemer Wires—Hard-Drawn annealed, or oil-tempered Spring Wire, Chrome Vanadium Spring Wires—Valve Spring—Music—Clip—Pin—Hairpin—Hook and Eye—Broom—Stapling—Bookbinding—Machinery Spring Wire—Reed Wire—Clock—Pinion—Needle—Bar—Screw Stock—Armature Binding—Brush—Card—Florist—Mattress—Shaped—Rope—Welding—Flat Wire and Strip Steel, High or Low Carbon—Hard, annealed or tempered—Clock Spring Steel—Corrosion and Heat Resisting Wires. Consult the Wissco technical man on your wire problems, however large or small.

applied to a surface grinder, the automatic sizing facilities provided by the internal grinder manufacturers, and, more recently, the provision of automatic compensation for wheel wear on cylindrical centerless grinders applied to through feed work, that this problem was really tackled. However, it now looks as though developments in this direction will continue to the point where wheel wear compensation will no longer be a serious obstacle in the way of complete automatic sizing within close tolerances.

The main problem confronting the machine designer has been to produce a machine capable of sizing within close tolerances, the machine being operated by unskilled labor. This condition has led to the introduction of many ingenious gages, some with audible, but most with dial type mechanisms which automatically tell the operator when the high or low limit of the tolerance is being approached. While gages of this type will, of course, check the work and tell the operator where his size errors are, this procedure only partially lightens the burden on the grinding machine operator in securing size, and it was not until the introduction of the grinding wheel wear compensating mechanism that any automatic means was made available to the trade at large.

The general acceptance of the theory that grinding wheels should be measured as regards efficiency by the amount of metal removed in a given time rather than by the length of time which the wheel would last, has automatically led to the use of much softer bonded grinding wheels than had hitherto been the case. While this factor materially increased the rate of metal removal possibilities of most of the machines on the market, it also at the same time intensified the problem of grinding wheel wear compensation.

In those cases where the quantities of work involved are so small that it would not pay to set up a machine for entirely automatic operation, a compromise has been effected which amounts to a push button inching control over the sizing facilities on the machine. This type of equipment has many attractions, inasmuch as the operator when gaging the work, even at some point remote from the machine, can by pressing a push button, inch in the control one ten thousandth of an inch at a time.

In all manufacturing schemes where close sizing within fine tolerances is a necessity, the cost of adequate inspection prior to assembly is an important one. In those instances where the functions of the inspector and the operator taking care of the final grinding operation can be merged, there are some very real economies to be obtained, and it is this thought which actuates the provision of the automatic compensation for wheel wear equipment now found on many precision grinding operations.

The makers of round bar stock also find that in many cases it is extremely attractive economically for them to pass their product between the wheels of a centerless grinding machine, thereby automatically controlling size and at the same time removing scale and providing their inspectors with the wherewithal to readily detect seams and cracks which would otherwise only be brought to light in the customers' works. This procedure also, of course, takes care of the sizing of the bar within the limits prescribed by the trade practice. In other words, the grinding machine is made into an inspection unit.

Recognition of the fact that the dead stop method of sizing leaves a lot to be desired from both the points of view of accuracy and speed, a number of gaging devices have been developed, the chief of which are the Pratt, the Arnold and the Krupp. These devices are what might be termed indicating calipers, and as they are made in such a way that the calipering does not interfere with the actual grinding, the operator has in front of him a visible moving record of the size of the work, and as the amount of stock to be ground off diminishes, so the operator exercises a proportionate amount of caution as he approaches nominal size.

The use of this type of gage has effected some very striking economies in the costs of production on almost every class of work to which it has been applied, particularly in the automotive industry, where tolerances are fine and the limit system is worked so consistently.

Recent developments with the calipering type gage indicate that the day is not far distant when the caliper mechanism will actually control the movements of the cutting tool, and one such installation is already in use. In this particular case, as the finger on the dial gage approaches the tolerance limits, an electrical contact is made which causes the grinding wheel head to recede, the actual control coming from the gage itself. It is safe to say that developments along these lines will still further reduce the cost of production and particularly the cost of obtaining accurate size control under intensive manufacturing conditions.

Factors Which Affect the Hardenability of Steel

THE seventh Edward De Mille Campbell memorial lecture of the American Society for Steel Treating, entitled "Factors Affecting the Inherent Hardenability of Steel," was delivered by Edgar C. Bain, metallurgist, the United States Steel Corpn. Research Laboratory, on Oct. 5, at the National Metal Congress, Buffalo.

The speaker chose as the measure of relative hardenability the depth to which a particular sized specimen would harden when quenched from a certain temperature into a bath of particular heat-abstracting power. It was reasoned that the hardenability of a steel specimen depends wholly upon the maximum speed at which the austenite thereof may inaugurate transformation to fine-pearlite at the minimum Ar' temperature. The factors affecting hardenability were classified as inherent in the steel and as merely developed in a particular sample in its preparation for quenching.

This maximum rate of austenite transformation to products other than martensite, i. e., at Ar' rather than Ar'', is in turn largely determined by the condition of the austenite with respect to two factors:

"1—Its composition with respect to dissolved elements, most of which retard, though some may hasten, its transformation to pearlite. Manganese, chromium, nickel, silicon and aluminum definitely slow up the reaction and so contribute directly to deep hardening about in the order named; on the other hand, tungsten, cobalt, molybdenum, vanadium and possibly oxygen appear to induce shallow hardening, though most probably indirectly by restricting grain growth.

"2—Its effective grain size. The finer the grain size, the more rapid is the transformation to fine pearlite, and correspondingly the lower is the hardenability. Indeed effective grain size seems to be the most potent single factor influencing hardenability; it in turn is probably controlled largely, for any specified temperature, by the obstruction to grain growth offered by large numbers of very finely dispersed particles, of exceedingly small aggregate mass, comprised presumably of stable oxides such as alumina, vanadia and probably silica or silicates."

The speaker closed by setting forth two questions which a consideration of information available prompts one to ask:

1—May it be that the primary influence of any element (including oxygen) in true solid solution in austenite of a specified grain size is to retard the rate of transformation and hence to favor deep hardening?

2—May it be that the main effective contributor to shallow hardening, apart from freedom from alloying metals, is oxygen combined with various elements, particularly aluminum, vanadium, etc., in the form of a fine dispersion of insoluble particles?